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atomic

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3ds max
See page 10

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MAXIMUM POWER COMPUTING

5

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Next-gen CPU tech

Faster

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3rd

Birthday
Issue

UPGRADE
SLUGFEST!



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RADEON 9800 XT vs FX5950

Budget blasters
RADEON 9600 XT vs FX5700

Power Laptops
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Unreal Guru
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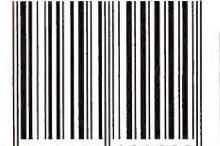
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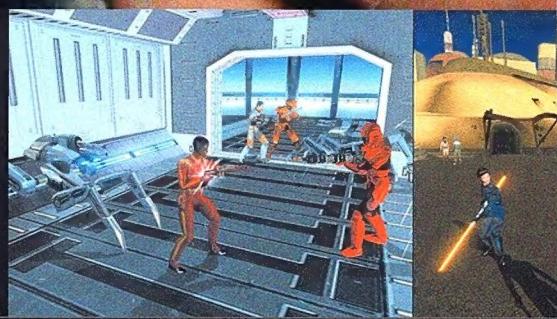
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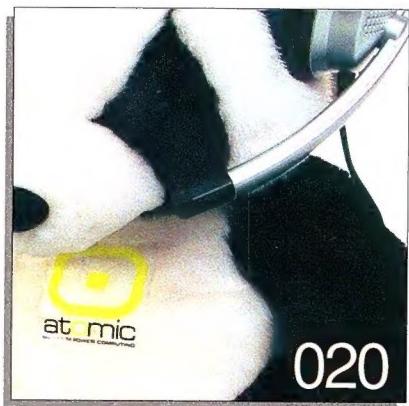


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N-GAGE

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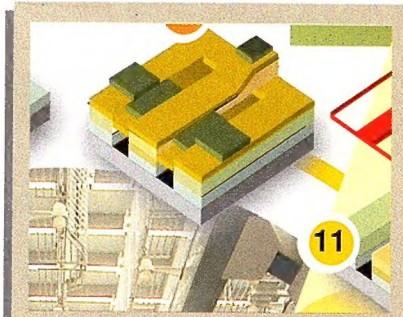
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X-Ray

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024

Silicon has to be the coolest element ever. Gold and silver you can spend – but silicon is forever. Let us put it to you this way: would you take an Athlon 64 FX, or a four-carat diamond?

Yeah... we know you *too* well.

John Gillooly is of the same CPU persuasion, thanks to his background in all things geomorphic. If you're feeling the need for some semi-conductor info, then check out this X-Ray on processors and the technology behind these miniature powerhouses. It's tasty – we promise.

» Free stuff



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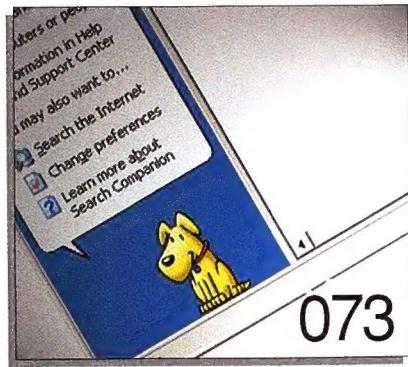
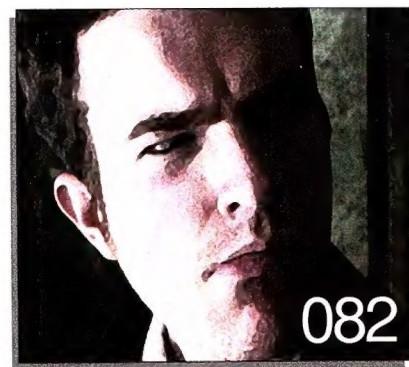


Feature: Notebooks

036

Confused about the next thing in mobile computing? Don't be. John Gillooly is right here to explain the lovely, tiny details on notebooks, laptops, desktop replacements and whatever other name has been invented by marketers.

Do they have a future? Are they the future? What should you look for? Alright – enough with the questions. Go check out this article and find out if you need a laptop. Or notebook.



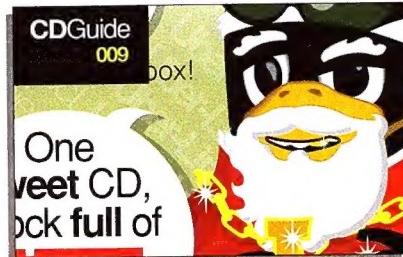
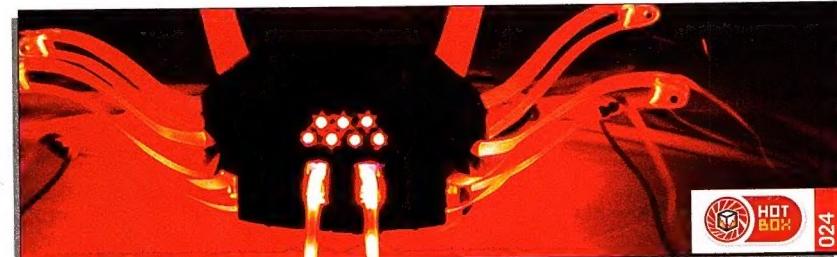
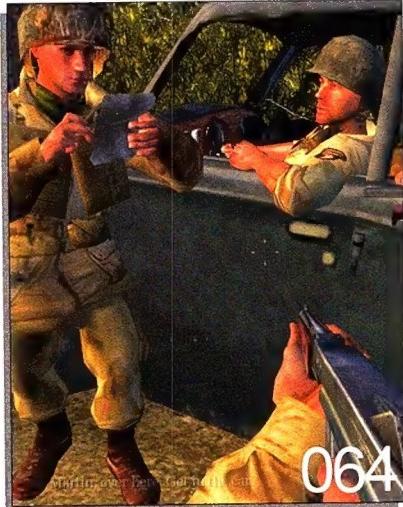
Head to Head

9800XT vs FX5950

032

We put these two cards side-by-side, expecting them to immediately hiss at each other. While it took a cup of water to make that happen, you could easily feel the heat emanating from their heatsinks. Oh yeah... They were ready to render.

Not only did we place them next to each other, we also had Nathan Davis — a qualified video card referee — stick them into a computer and benchmark their PCBs to melting-point. For the uninitiated, that's tech speak for 'hardcore testing.' Oh yeah.



Developers, developers



I landed just a couple of hours ago, from spending four good days at the Australian Game Developers Conference (AGDC). There's now just enough time to punch out this editorial before we go to print. Bam bam bam. . .

Naturally, we'll be doing a proper AGDC report for next month. I'm looking forward to putting that together. Helping to cover the event bigtime for *Atomic* is funnelbc, forum hero and quality freelance journalist. Thanks funnel!

Every year the AGDC event just gets better. The first AGDCs were a test of the water. A small group of Aussie developers got together for a weekend and talked about how they could work together to grow the local scene. In later years, the conference widened up, with students of the new games courses attending, as well as their lecturers. Overseas developers were invited to give presentations, with this year's import speakers being the best yet, and their presentations covering a wide spectrum of the scene.

It really is wonderful to have an annual event that young games students can spend several days at, learning from experienced pros in the presentations, and then having easy access afterwards to ask anything and everything. Many a young hopeful turned up at the AGDC with nothing but dreams, but left with the knowledge that there are many open doors, and that if they follow their dream it can come true.

The students know that many years of hard work lie ahead, if they're to succeed. The definition of success is probably different for many, but let's broadly call it having a game published. Imagine the pride a person would feel, seeing a game they had worked on, there on the shelves, all shiny in the shrinkwrap of Official Success. Magical.

It's ironic then, and personally depressing, to see that the official AGDC LAN (Lanfest) was little more than a Leechfest. Yes, just one floor up from the masses of young game developers searching to make it big, were a hundred or so 'gamers', many of whom were there purely to help themselves to free copies of the latest games. What a joke. The most popular game there wasn't CS, but DC++. The AGDC organisers' heads are firmly in the sand – they spend so much time and money creating an event to encourage young gamers, but allow the fruits of their labour to be stolen at the very same event. The LAN should have been properly policed for piracy, being part of the AGDC and all. It's really very sad.

Not so sad was the happyjoy of being able to meet the many Atomicans who visited the *Atomic* stand. New and old faces turned up and it was a treat to be able to hang with Atomicans I've only known on the forums. Thanks for dropping by people!

And off we go for another grand year of *Atomic* in 2004! After so many memorable 'Atomican' columns, it's a big thanks most heartily to Wilkshake for taking the Atomican reigns. The bloke with his finger on the pulse of *Atomic* has done much to bring the world of the community into the mag. Cheers Wilks. Dun good.

Taking over Atomican duties is everyone's favourite alien; Virtuoso. That starts this month, we all hope you'll enjoy Virt's presence in our mag. We look forward to seeing where he'll take Atomican, knowing well he only posts gold online, and now, here.

Onwards!

Ben Mansill
Editor

atomic

MAXIMUM POWER COMPUTING

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The *Atomic* website, via the browser that comes with KNOPPIX.

KNOPPIX

KNOPPIX is the work of talented German engineers and is best described as Linux-on-a-CD. You can boot, use and play to your heart's content with a complete Linux desktop system without ever having to touch your hard drives. If you haven't so far explored just what this Linux fuss is all about, now you can do so safely and hassle-free.

There's plenty to play with in KNOPPIX. Don't let the size of the CD fool you. Through the magic of compression KNOPPIX comes with some 1.7GB of programs, including applications such as browsers, office suites, multimedia players, network sniffers, file sharing servers and much more.

To help you make the most of KNOPPIX we'll cover some of the more interesting points here.

Booting KNOPPIX

KNOPPIX is a bootable CD, so all you need to do is ensure your BIOS is set to boot from CD-ROM. KNOPPIX does a pretty good job at detecting and configuring all your hardware, but it is by default configured to run on the widest range of systems. As a result it defaults to a 640 x 480 resolution and a 60Hz refresh rate. Thankfully you can specify options at boot time to tailor its operation. If you know, for example, that your monitor can happily handle a 1,024 x 768 resolution and 85Hz refresh rate you can specify this when you boot KNOPPIX like so:

knoppix screen=1024x768 vsync=85

There are other handy options you can add as well. Keep in mind that KNOPPIX boots and loads all applications straight from CD, so it can only run as fast as

your CD-ROM. If you have more than half a gig of RAM you can tell KNOPPIX to load the entire CD into memory at boot time with the 'toram' option (just add it after 'vsync') and you'll have a very fast desktop operating system indeed. For a full list of the boot time options take a look at 'KNOPPIX/knoppix-cheatcodes.txt' on the CD while in Windows or Linux.

Using KNOPPIX

KNOPPIX will try and automatically grab an IP address for your network card via DHCP when it boots. If you use a static address, or DHCP didn't work at boot time, first click on the cute penguin in the 'start' bar (second from the left) and select to configure your network card. Configure your card as you would under Windows with DHCP or a static IP address (don't forget to write down your ISP's DNS servers before you leave Windows).

Once configured you should be able to access your network and the Internet as per normal. Check by launching Mozilla or one of the other bundled browsers and surfing to:

www.atomicmpc.com.au.

KNOPPIX uses the KDE (K Desktop Environment), one of many desktops available under Linux. It's very much like Windows but sports much more configurability. Start exploring it with the Desktop Settings Wizard under Settings → Desktop Settings. This allows you to play a little with styles and then launch the comprehensive Control Center.

Highlights of some of the applications include the The Gimp image manipulation program, K3B CD authoring, QCAD, desktop publishing with Scribe, XMMS for music (aka WinAMP for Linux), OpenOffice, and even some trendy time wasters like Frozen-Bubble.

Speaking of which, while KNOPPIX will run games it makes use of the XFree86 graphics drivers, which excel at 2D but lack proper 3D support. If you play games such as America's Army or Unreal Tournament they will run unbearably slow unless you install accelerated drivers, such as the NVIDIA Linux drivers. Bear in mind KNOPPIX is designed as a workstation distribution, so this can't be easily done on the read-only format of the KNOPPIX CD.

Lastly KDE isn't the only desktop system KNOPPIX comes with. Check out the aforementioned cheatkeys for a list of alternative desktops. For a sleek and minimalist approach try adding



Atomic CoverCD

This month we have a special Linux-themed CD that's for everyone. On it you'll find the latest version of KNOPPIX, a unique self-contained bootable Linux desktop system, as well as the much requested five-part Uber Linux Box Project.

Contents

- **KNOPPIX** – Complete Linux desktop on a CD.
- **The Uber Linux Box Project** – Revised and reproduced from issues 20, 21, 22, 23 and 30.



No.7 Linux made Uber

'desktop=fluxbox' to the command line when you boot.

Also if you like what you find you can setup KNOPPIX to use a portion of your hard drive for storing user account details, such as your configuration settings (see 'Create persistent KNOPPIX home directory' under the KNOPPIX menu). KNOPPIX will automatically detect and allow you to access all FAT32, NTFS and Linux based partitions it finds, but keep in mind write support to NTFS volumes is disabled as the driver is still under development.

The Complete Uber Linux Project



Under the 'atomic' directory on the CD you'll find a HTML version of all five parts of the popular Uber Linux Box Project. Additionally the atomic-kit.tar.gz file that includes the *Atomic* Firewall and *Atomic* Uber Shaping (AUS) bandwidth shaping script can also be found in the *Atomic* directory.



News

ShortCircuits

A group of researchers at the Technion-Israel Institute of Technology have managed to construct, using carbon nanotubes, nano-transistors with the help of biological agents. Using DNA molecules from *E. coli* bacteria, as well as antibodies, the team was able to create 'self-building' nano-transistors. The process involved grafting DNA onto conducting wire – as DNA itself doesn't conduct electricity – and allowing the biological elements to bond. Experts said the accomplishment was an amazing leap forward for nanotech.

US Software programmer Charles Booher was taken into custody after threatening to do a number of unpleasant things to the employees of a Canadian company. The company allegedly sent him a large quantity of unwanted spam, mostly to do with organ enlargement. Among other things, Booher threatened to ice pick, shoot and infect employees with anthrax. But he admitted that the spam was a result of his own carelessness – blaming a program that he unintentionally downloaded as the source of the unwanted messages.

Apparently, child pornographers have a new scheme up their sleeves. Thirty-six year old Walter Nowakoski was arrested while driving down a one way street – not that interesting, until you take into consideration that he was derobed from the waist down with a notebook on his lap. The notebook was equipped with wireless capabilities, and Nowakoski had hacked into a neighbourhood PC over the wireless connection to access the Internet and allegedly download child pornography. Weird.

discreet
combustion

artomic
of the year



Artomic of the year

Artomic is fast building a reputation as an 'of the year' specialist. This means we often take a collection of awesome, related things – in this case, Artomic entries – do a little (artistic) judging, and reward the best of the best with an unbelievable prize. Artomic of the year is the latest entrant into the *Atomic* 'of the year' selection, and with it comes the sweetest prize known to man – a full, yours-to-own copy of 3Ds max worth \$9,000, thanks to discreet (www.discreet.com).

Hold the creative juices, because there's more to come. Discreet is also being stupendously generous by offering 24 copies of combustion as

prizes (a total of 12 months-worth), for Reviews Artomic (page 58, this issue) and Games Artomic (page 40, this issue). That's another \$48K worth in software, bringing the grand pool of prizes up to \$57,000!

If all this injection of sheer winning pleasure wasn't enough, we've also managed to grab famous Quake 3 Arena modeller Paul Steed to judge the competition. Paul's not only great with Tools > Carve, he's also equipped with the expert eye of an artiste. You can be sure all entries will be marked on their artistic merits and not just their quality, so make sure you put some thought into your dazzling creations. As a bonus, Paul will also provide the winner with a critique of their work.

AOTY entries will be included from when discreet started sponsorship of Artomic (*Atomic* issue 33) and so will be judged in issue 45, in 2004. The actual winner will be announced in issue 47. Paul will judge from the collective pool of Games and Hardware Artomics, but, just like any momentous competition, there can be only one winner. Only the best of the best Artomic will make it through.

We'll take the opportunity now to urge that Hardware and Games Artomic are exactly that – the entries must be themed according to the section they will appear in. So turn on the liquid creation and start dabbling. For all the details on Artomic (including the email address that entries should be sent to and image requirements), check out pages 40 and 58.

LB

Feeling Jolty?

WINHERE!



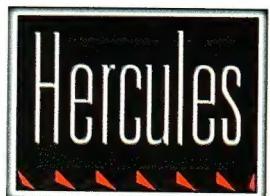
What can we say? Jolt is so enticingly slick and bubbly, we had to combine it in some way with *Atomic* (which is also enticing) and cool, winnable hardware (also unbelievably attractive). To this end, we have a competition up and running especially for Atomicans. All you have to do is find yourself a delectable dose of Jolt (in can or bottle form) and drink it under the craziest of circumstances. Then, take a snapshot of your guzzling shenanigans and send it to: joltpics@atomicmpc.com.au or mail it to PO Box 2286,



Strawberry Hills,
NSW 2012.
You have until
16 April, but we'd
very much like to
see you doing
something bizarre
before then.

If your entry is selected as the winner, you'll score a QDI MiniPC barebones system, a set of Hercules XPS 5.100 speakers and a Leadtek DV2000 video-processing card. That's almost a grand's worth of top quality gear, thanks to BCN Technology (www.bcn.com.au).

For more information, as well as competition updates, visit www.atomicmpc.com.au/jolt.asp.



LB

atomican

Chernobyl chain reaction, fallout from your favourite magazine continues to mutate the social lives of Atomicans across Australia.

The molten core of the fast breeding AtomicCommunity can be found online (www.atomicmpc.com.au/forums.asp). It is here that hundreds of Atomicans – from hardcore geek to mild and meek – gather to discuss life, the universe, fact and fiction.

In fact, there was a fraction too much much fiction in the General Forum this month... so much so that 1shot1kill was moved to create an *Atomic Author's Compendium* (forums.asp?s=1&c=1&t=16527). However, the creativity of Atomicans defied this attempt at containment when Tiger Bailey, Cisco and Robo Uli decided to host a new Creative Writing Challenge (forums.asp?s=1&c=1&t=25303). Twenty-one creative pieces later, Tyme's angsty anthem 'The Way Things Are' was voted popular winner, and Gramyre's vision of cube farm hell was runner-up.

As last month's wildly successful Nude Photo Competition demonstrated, the creativity of Atomicans extends well beyond the realm of the written word. Czerney's nattily-named Photo of Yourself Reading an *Atomic Magazine* in a Funny/Unusual Location Competition (forums.asp?s=1&c=1&t=26110) prompted a further flurry of flashing (from digital cameras, of course) across the land.

So, online is on fire. But sooner or later, even the most awkward Atomican lurkers will feel the urge to get out out from behind their modded keyboards and venture into the *real world*. Fortunately for them, a burgeoning agenda of community BBQs, road trips, camping expeditions and pub crawls is on hand to satiate their social urge in the Community Events Forum (forums.asp?s=1&c=5):

The mother of all upcoming community meets is Irradiate, the celebration of *Atomic's* third birthday planned for Brisbane, January 23 to 25. A mega-LAN with freebies, frivolity and the traditional FrisbeeMark PC peripheral tossing competition, it is sure to be geek ground zero. Reserve your place now (forums.asp?s=1&c=5&t=502) and hook up to hitch a ride.

Finally, let's remember that not everyone will get a new tech toy under their tree later this month. Visit Chef's *Atomic Giving Tree* (forums.asp?s=1&c=1&t=24811), sign up to donate a gift, and shine a little *Atomic* glow into the lives of less fortunate children this Christmas.

Virtuoso



POTM 36

www.atomicmpc.com.au

Steven Spielberg has a hell of a lot to answer for...

A generation of kids are most certainly too afraid to go back in the water. Most

sadly, among these innocent victims, is moz. This normally brave and tough Queenslander has fought his personal demons, and sort of won, sort of made it worse.

Moz's account of his fishing/facing the fear expedition is as sweetly written as it is hilarious. Stay inside with your MX700 moz. You know it's safe there!

<http://www.atomicmpc.com.au/forums.asp?s=1&c=1&t=25928>

AUSEGAMER



The month dawned and found us sitting at the Australian Game Developer's Conference (AGDC) in Melbourne. As usual the exhibition was a small showcase of local Australian talent and international delegates, providing some excellent looks into the development cycle and creative process in making that next hit game of the season.

And Ausegamer being itself, we ran amok ferreting out some of the cooler tidbits sure to affect the future of the e-sports we love.

The first thing that struck us was the industry look on pro-gaming, which is possibly the most ignored facet of game development over the past few years. Finally they've woken up to the new world.

Talking to the AGDC representatives from various universities and schools, such as the Academy of Interactive Entertainment and RMIT, we found willing voices in approval of a pro-gaming development focus. Imagine a game made purely for the purpose of being played professionally in competition; an entire game where every piece of code was optimised against lag, cheating and netcode violations. Since the soaring popularity of titles like Starcraft, Half-Life and Quake made gaming a mainstream market, the focus has always stayed on developing the games for specific genres, not necessarily that of a key pro-gaming demographic.

There is no doubt in our minds that growing popularity of e-sports as a digital form of entertainment is changing the look and feel of new titles. An excellent theory passed around was that of the destruction of conventional gaming at the hands of a pro-gaming mad public. This would entail the gaming public being slowly integrated into the pro-gaming mould, spawning a world-wide community in the millions, encompassing the industry in the process. Everyone would be drawn to those games requiring the most skills in micro-management and teamplay, rendering lesser titles in these aspects into obscurity. As popularity continued to grow, people would continue playing a very set few games until the industry does what it has always done to survive – adapts like the Borg and clones those few titles at an exponential rate. We could literally be left with a single game in each genre!

No theory is plausible without a solid defence and we found it in the original FPS market of old. Anyone who remembers the release of Wolfenstein and Doom would recall the market quickly became overwhelmed with FPS titles. In the debacle that followed (otherwise known as the late nineties) genres simply disappeared. It took years of atrocious clones for the public to turn back to new forms of gaming. What we're getting at is that this idea of the destruction of conventional games was not a new one, it almost happened!

As the neon signs say, this is the future and a future where gamers are spread over the globe in their millions, and where button mashing skills are a commodity. We have an obligation to the brilliance of game developers to give every game at least a chance, lest we be left with the beginnings of the nightmare discussed above.

So put down the railgun for a month and celebrate the variety of games – it's what we're doing. Start appreciating games for more than their ability to let you smack down the competition.

Now, if you'll excuse me, there is a certain purple tentacle wreaking havoc across time and I've got cherry trees to chop.

SD

What's Hot

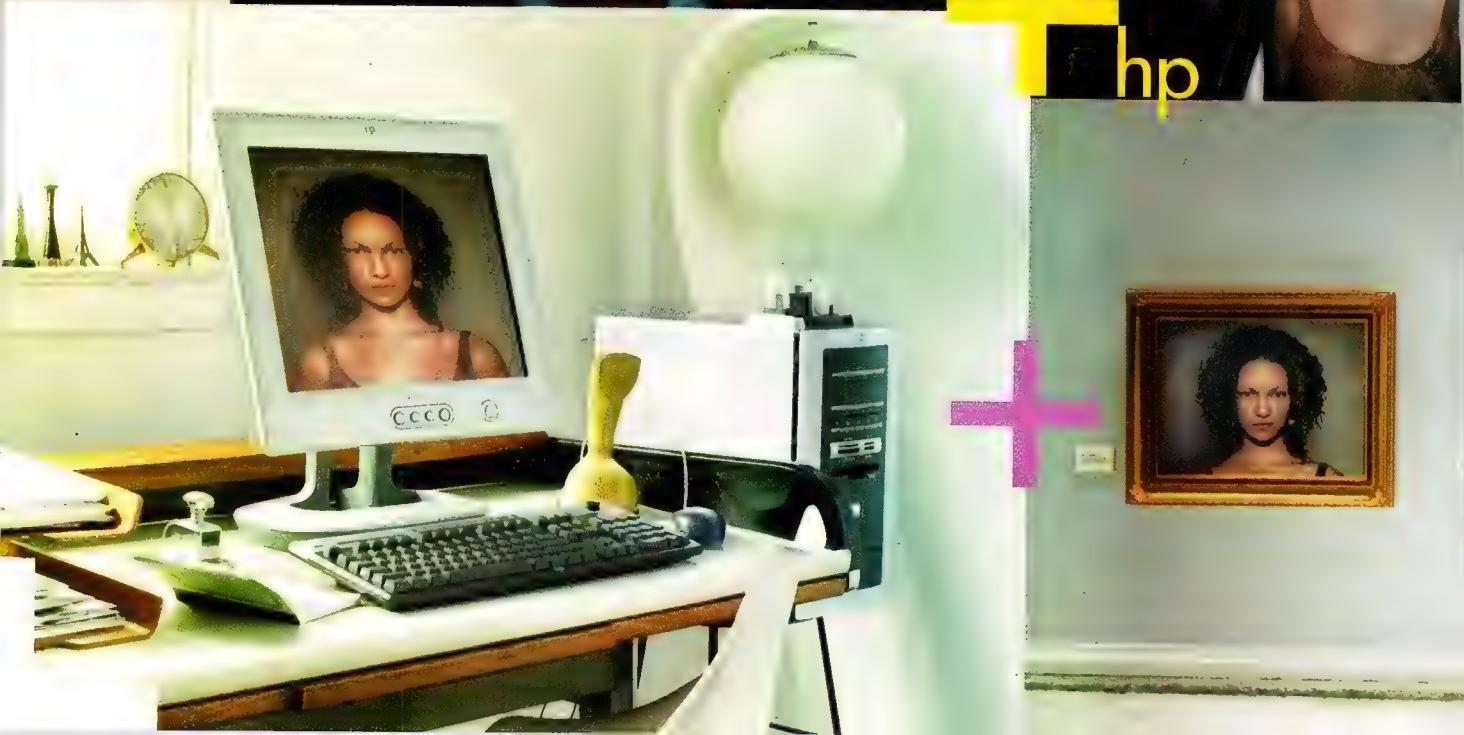


- Deus ex machina – ghost in the machine
- Lord of the Rings: Return of the King – Liv isn't dead yet!
- Matches – bring out the inner arson
- Semiconductors – mini powerhouses
- Hotbox – watch the splendor!



What's Not

- Deus Ex 2 – gives up the ghost
- Return of the Blues Brothers – why aren't they both dead?
- Matrix – demise of a franchise
- Semi-trailers – your car will never be safe
- Hot dog – watch what you eat



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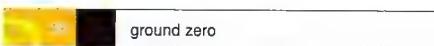
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FREE THE IMAGE



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Sounding better

Dan Rutter cleans out his ears to let the sound flow freely.

People, in general, are a bunch of cloth-eared gits.

Seriously, they are. There's no other explanation for the overall awfulness of PC audio.

Oh, all right. *Maybe* there's another reason why so many people tolerate hideously lousy sound. Maybe they just don't tremendously care about sound quality; anything better than the PC speaker will do.

If you're just playing the occasional game, using office applications, maybe playing a bit of random music as mental wallpaper while you do other things, then sure, it'd be fabulous if you had Yahweh's Own Sound System, but those two little plastic boxes that someone paid far too

inserting a stereo 1/8 or 1/4 inch plug all the way.

Want big speaker sound for your computer, dirt cheap?

A lot of people have an old stereo of some sort mouldering away in the garage; if not, flea market enthusiasts can easily find one for \$25 or so. An elderly wood-sided receiver hooked up to a pair of plaid-grilled speakers that looked cool in 1977 will solidly sonically defeat almost all three-piece 'multimedia' speaker systems, provided it works. And that's not so hard to ascertain, even in the middle of a garage sale or op shop.

Steer clear of those disastrous Tandy systems with giant masonite speakers that contain one piddly little driver. Check the

Steer clear of those disastrous Tandy systems with giant masonite speakers that contain one piddly little driver

much for at Dick Smith Electronics 15 years ago will do.

OK. I can see that.

If you're considering an upgrade for your PC audio transducers, though, there are ways to get better value for your speaker- or headphone-buying dollar. There are also ways to improve the sound of your existing setup for free.

First up, the same advice you'll get from those Get The Best Sound From Your Crappy Little Mini System pamphlets...

Satellite speakers should be aimed pretty much at your head. If your speakers have ports, those ports shouldn't be hard up against a surface (wall, desk panel, bookshelf). It also pays to experiment with the position and heading of your subwoofer, if you've got one.

And there's the old phase problem, too. If you've got one or more bare-wire connections in your speaker system and you've pushed one wire-pair into its spring terminals the wrong way around, everything'll sound quite severely peculiar. You can get a similar effect by not

drivers in other speakers to make sure their rubber cone surrounds haven't perished, and nobody's kid has at some point stuck crayons in the tweeter.

Then, acquire a \$5 1/8 inch to twin RCA lead, and you can connect any PC's sound hardware to the aux input of the old system's amplifier (or separate pre-amplifier, if it's fancy). The speakers almost certainly won't be magnetically shielded, so don't put 'em next to your CRT monitor. And you're done.

What about headphones?

Glad you asked.

A lot of people who listen to their PC through speakers would actually be a lot happier with a decent pair of headphones. Gamers who like positional audio are a case in point here; it's difficult and expensive to set up a speaker system that can match a mid-range pair of headphones for 3D sound.

If you've got an MP3 player, it probably came with terrible headphones. Even if you need 'phones you can jog with, there are lots of better options that don't cost a fortune. Koss and Sennheiser both make decently priced small ear-clip and

headband 'phones that beat every bundled 'earbud' tiny-headphone by a mile.

Personally, I like Sennheiser's big over-ear headphones, as much for their comfort as for their sound. There are plenty of other candidates though, which are best experienced in a proper hi-fi store that'll let you try them on and listen to music you brought with you.

One option that many hi-fi stores don't offer are 'in-ear monitors'. They're not like the standard little earbuds that you wedge over your ear hole; instead, they plug in like, well, earplugs. This gives them superb acoustic coupling to your eardrum, allowing amazing bass response from such tiny devices. It also gives them massive isolation – blocking of external sound. In-ear 'phones can block noise better than much bigger, and more expensive, active noise reduction 'phones.

Etymotic Research (www.etymotic.com) is the big name in this area, but its cheapest model sells for around \$250. Sennheiser, Sony, Shure and Koss have gotten in on the act with cheaper units.

In-ear phones become uncomfortable after extended use, they have problems with sound conducted through their cables if you bump them, and people who can't abide earplugs hate them from the get-go. But if you can stand them, they're great for mobile listening (especially on aeroplanes) and noisy workplaces.

Not everyone can be rescued from audio purgatory. Some people call tech support about 'reversed stereo' that's caused by speakers set up on the wrong sides of their monitor. Other people swear that US\$700 is a fair price for a super-exotic power cable for their safe-sized amplifier – which raises some questions about how expensive a similar upgrade for the rest of the electrical grid would be.

But you don't have to be a golden-eared religious fanatic audiophile to hear the major differences between a bog standard set of plastic multimedia speakers and a nice old stereo system, or between some bundled earbuds and some good headphones.

The computer store's audio section is not the only place where slammin' sound can be found.





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**Entering Earth's atmosphere
December 3rd**

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The emperor's new CLI

Microsoft returns to the olden days with a brand new command line interface, Ashton Mills explores.

One of Microsoft's strongest selling points for Windows has always been ease of use. The GUI (graphical user interface) we've come to know and love is the interface for just about every task we do. But this may soon change.

If you think about it, by definition a GUI not only makes certain tasks easier, but also requires that these tasks be created with the GUI in mind. Programs not only benefit from the design of the GUI, but also must *conform* to the GUI. This places limitation on how a program can be used and also on the functions it provides. For a user interacting with a

about it the right way too. Far from being COMMAND.COM on steroids, Microsoft's next-gen CLI is looking to be a killer feature in the upcoming Longhorn release, which is slated for sometime in 2005.

Codenamed MONAD, the all-new MSH (Microsoft SHeLL) is every system administrator's dream. It not only mirrors the popular functions and ease of use that you can find from one of the many shells under Linux, it's being built from the ground up to be tightly integrated with Windows, enabling users to do things in Windows that even Linux users can't natively do through the prompt.

While still under heavy development

Finally it may be possible to administrate your Windows servers without... a GUI. Can you imagine life without windows?

machine, a GUI can be as restricting as it can be freeing.

This is something that Unix users have known for a long time now. As anyone who uses a Unix-based operating system will happily tell you, no matter how sexy a GUI is, there are simply some tasks that are more easily done through the command line interface (CLI). For many it's the primary means of interacting with the machine, and if anything a GUI is simply a method to more easily support the use of multiple CLIs at once.

If you've ever seen desktop screenshots of some of the popular Linux desktops you now know why there always seems to be a CLI running in the background.

And now, it seems, Microsoft has learned this too. After spending so many years distancing itself from Unix, and going to great lengths to minimise the importance of the command prompt in Windows, it's not a little bit ironic that Microsoft is now developing a fully featured CLI for future versions of its operating system. And it's going

you can at least expect the usual features — command line completion, command history, aliases and redirection, and an as yet unknown level of scripting. But MONAD also includes some interesting abilities tied to the platform, such as an option to return results to shell queries as .NET objects or formatted in HTML, XML, Excel or plain text list format. So you could, for example, run a search query on your system and create an Excel spreadsheet out of the results straight from the command line.

MONAD will also support the ability to map (or 'mount' for the Linux junkies) more than just drives to drive letters. For example, being able to map the system's registry to a drive letter and explore it like just another part of your filesystem. This sort of versatility has been enjoyed by Unix users for a long time now, so for those of us who use both operating systems (c'mon, who doesn't?) it will certainly be a welcome feature.

But MONAD offers other possibilities too. Finally, it may be possible to

effectively use and administer Windows servers without wasting resources on, or being open to more vulnerabilities through, a GUI. Can you imagine it? Windows without windows!

The reception of the new CLI so far has been mixed. Some think it's great and see it as Windows finally catching up to the rest of the world. Others are wondering whether it will actually complicate things for Windows administrators (some are afraid Microsoft won't follow the KISS – keep it simple, stupid – design principle). And others still are wary that Microsoft is now adding to Windows one of the most powerful features of Unix and that there will be one less advantage a Unix system holds over Windows. Which is, it's not hard to guess, precisely the point.

I, for one, am looking forward to it. I'm a command line junkie, there's something inherently enjoyable about the functionality and efficiency of the command line. Ever since DOS with XTreeGold, all the way to bash and Midnight Commander under Linux, the CLI has been the ultimate in full control of a system.

I've always seen the GUI as a complement to the command line, not a replacement. It's interesting to think that, just as we have legions of bash fans (or tcsh, or csh, or ksh, or whatever your poison happens to be), that we may soon also see MSH fans exploring and maximising the capabilities of the new shell. And from this administrators and end users alike will benefit.

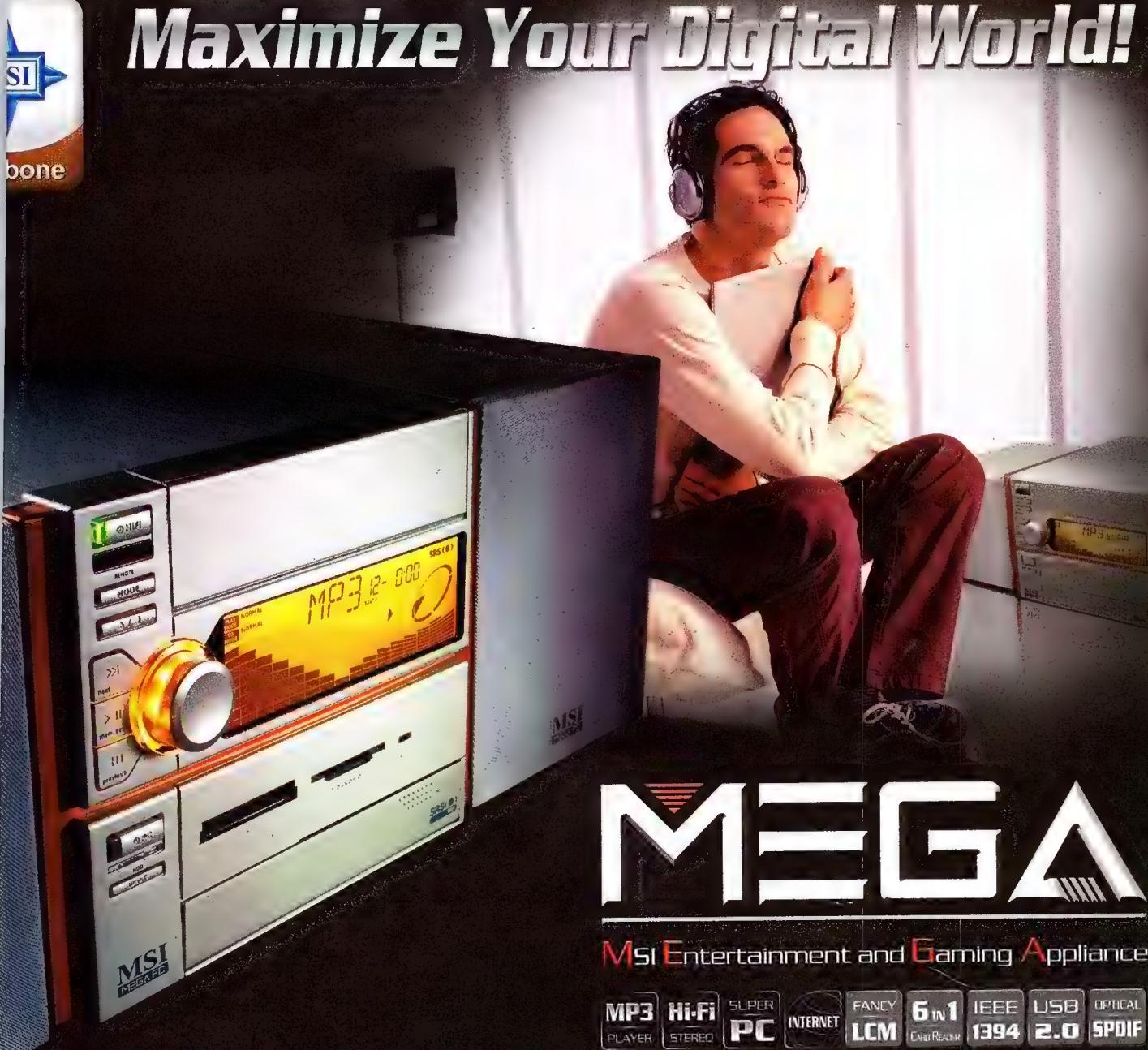
While it's been flogged at least as much as the leaked Half-Life 2 code, I feel it is my obligation to pass on the joke – speculation has been rife about what an open source version of MONAD would be called, should the sky fall and Microsoft feel a need to give away code, given the propensity for open source projects to make use of the 'G' from GNU. . .

Just like the joys of command completion, I'm glad I didn't have to spell that out.



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Tim's Zhas

Change, the only constant in this crazy universe. Tim Dean re-explores the far reaches of MMOs.

Find I quote: 'you're just another adventuring whacker'. And I quote again: 'so, what's to make me even think about going anywhere near SWG?'

If you're a regular reader of this column, then you may recognise these two piercing insights into the human condition come from rants I've had in the past. The first was referring to the gameplay premises behind massively multiplayer online games (MMOs), and the second was a deep lament over games that are released unfinished and riddled with bugs – in this case Star Wars Galaxies (SWG).

Well here, today, I'd like to give you a bit of an update, share a revelation, have

between your sphere-of-perception and sphere-of-influence, De Tocquevillian, sort of way. (My apologies about that last sentence – it was totally uncalled for.)

Another issue I had with MMOs was the role-playing premise where your character has to start off as a totally inept scum scraper, and has to 'grind' away for months, gaining experience, before eventually graduating to the lofty realm of mediocrity.

Well, (and granted it's been a while since I played EverQuest, which may have been remodelled in this way by now) SWG has seen significant tweaking of the gameplay structure compared to earlier MMOs, and things have improved. You still do feel an element of insignificance

part of a group, and they are so sought after that players adopting that profession become very popular. You also cannot ascend to the higher ranks without helping to train other characters, so interaction is necessary to get ahead. There are other small things too, like the fact you can't just drop loot. You either have to sell it or destroy it. As the economy is entirely player driven, with artisans crafting everything from weapons to clothing and buildings, there's a lot of good quality gear for sale at fairly affordable prices. As such, it's not uncommon to see a high level character dispose of their previous weapon/armour etc by donating it to a suddenly smiley new player.

Now I get to the grumble bit: it's not all roses and bofa treats. The game is still in many ways incomplete, and it's also still bugged to hell. Things have improved since launch, and the servers are definitely more stable and less crowded, but just about every profession has a list of bugs a mile long, making some, such as the droid engineer, virtually token. There are also many features, such as vehicles, that are yet to appear in the game. And I'm not talking about features that appear in expansions, these are basic features of the game that significantly change the play. For example, the galactic civil war aspect of the game is so bugged and incomplete that there's really only nominal reason to join a side – and this is one of the absolutely pivotal aspects of the Star Wars universe.

At the end of the day though, I am having a lot of fun in SWG – just enough fun that for now I'm willing to let the bugs and incomplete content slide – although as soon as it becomes tedious, man, I'm out of there – the US\$15 per month subscription already hurts enough when having fun. I also eagerly await a local server, although my 250-odd pings to the US are still playable for now.

So, if you do decide to fork out the cash to purchase an import copy, and pay the subscription fee, jump on to Valcyn, the unofficial Aussie server, and say 'hi' to Zhas the Zabrak bounty hunter. I may or may not shoot you back.

IFirst the secret: I've been playing SWG now for about a month. And the dark part: I really dig it.

a bit more of a grumble, and even admit a dark secret.

First the secret: I've been playing SWG now for about a month. And the dark part: I really dig it. I started off reviewing the thing with fairly high levels of ambivalence, but that rapidly changed into surprised joy.

The revelation: that the seasoned veterans over at Sony Online Entertainment (the creators of EverQuest and SWG) have learned a few of the lessons I suffered through while playing EverQuest and Ultima online, and have refined the MMO formula – and tweaked it in the right direction.

The main issue I had with MMOs was the subtle, but significant, shift in premise compared to single player games – that in the MMO environment you are really not that special. This is quite unlike a single player game where you are the primary protagonist, and events are shaped around you so that the choices you make and the actions you perform make a difference in the world. It can be quite disheartening, in a dis-empowering, dissonant distinction

when you first start, but you rapidly get to the level where you can participate in the greater game. This is because the skill system isn't as punishing as earlier MMOs. You actually start off being able to do stuff fairly well, and there are plenty of different skill trees to explore where the entry levels are not prohibitively high. There's still 'grinding' to be done, and low level players still have the hunting of experience as their primary gameplay motivator, although there is now enough variation in this that it's not too tedious.

Player versus player combat has also been improved, and slotted into the Star Wars universe, care of the galactic civil war. As such, any overt Imperial can attack any other overt Rebel on sight – although you're able to join a side without having to declare your faction in case you don't want to be a walking target.

Finally, and to me most importantly, there are a number of design decisions that have been geared specifically towards rewarding players for working together. There are classes that really only come into their own when working as

Shuttle creates, others follow...


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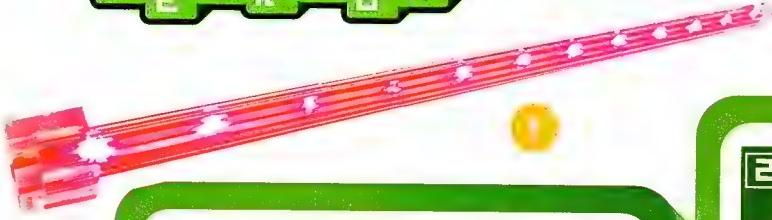
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G E A R B O X



1 Sunbeam meteor light

SUPPLIER: PC Case Gear

WEBSITE: www.pccasegear.com.au

PHONE: (03) 9568 0932 PRICE: \$29.95

This light-blazing stick-o-joy is made from 12 ultra bright LED lights set in an array. Available in either red or blue, these blinding sticks output a great vivid display of colour. There are eight different display settings, from a static all-on to a lustrous display of flashing lights. The lights can either cycle continuously through all of these settings, or be manually changed to stay on a particular one, using the bay control panel.

E Thermaltake Xaserbag

SUPPLIER: Mittoni

WEBSITE: www.mittoni.com.au

PHONE: (03) 9560 6100 PRICE: \$52 (large- 52 x 20.5 x 57cm); \$49 (small - 44 x 18 x 46cm)

When travelling to and fro between LANs, the worst thing is lugging around an awkward, bulky case, if you have one. The closest thing to having a million dollar sidekick carry-my-stuff robot is this slick case harness. It not only carries your machine, but you can fill the side pouch with keyboards and caffeinated drinks. This doesn't make the job lighter, but it looks sexy, in a computery kind of way. It carries up to 30kg.



E Mini cold cathode kit

SUPPLIER: PC Range

WEBSITE: www.pcrange.com.au

PHONE: (08) 8322 9544 PRICE: \$14

To some people's disgust, small bits are the craze these days – it seems smaller has now turned sexier. Crazy. This little 10cm cold cathode looks small in packaging, but has a huge heart – spouting out a decent level of bright light (capable of up to 18,000 cd/m²). If you haven't already filled every centimetre of your case with LEDs, this is a cute little light for any leftover nooks and crannies you may have. Perfect for small form factor cases.



L Bitspower strobing crystal lighting fan

SUPPLIER: PC Range

WEBSITE: www.pcrange.com.au

PHONE: (08) 8322 9544 PRICE: \$14

This quiet, single-ball-sleeved fan, as you can see, has lights – flashing bright blue/green/red lights to be exact (the mere definition of innovation is screaming in pain). This is better than Morse code – no one will ever understand anything it emits, with the lights flashing at a constant rate. However, a dial can adjust the speed from slow flashes to a trance inducing speed – causing so much damage even epileptic fits will look down in shame. Fantastic.



S Console controller converters

SUPPLIER: Anyware

WEBSITE: www.anyware.com.au

PHONE: (07) 3856 3999 **PRICE:** \$45 (Xbox-PC); \$45 (PS2-PC); \$40 (PS2-Xbox)

Adaptors for console controllers have finally hit retail. These perform insanely, and just as they should, on a console. However, we had game compatibility problems with the Xbox-PC version not supporting nearly as many as the PS2-PC. But all rumblings have been preserved, providing great, configurable feedback – all powered via USB. The PS2-Xbox converter also works a treat (with a memory slot also).

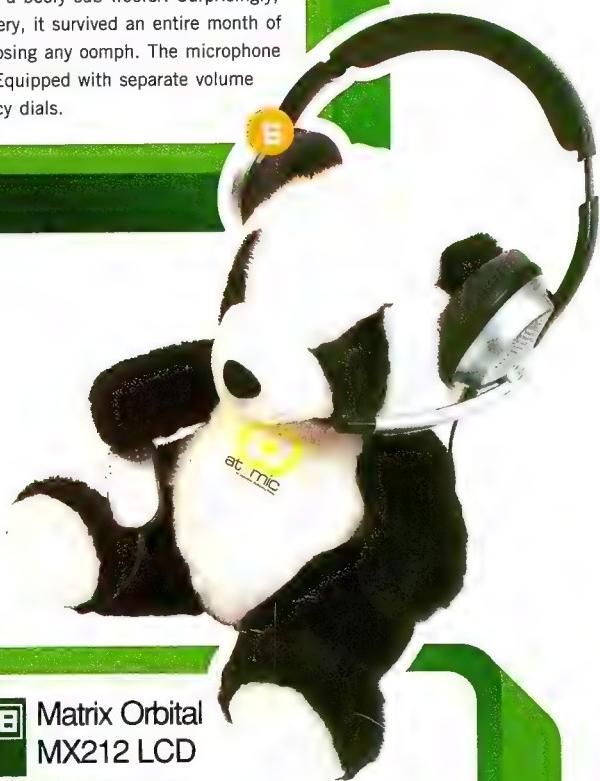
G Philips Gaming Headphone (HG100)

SUPPLIER: Crest Electronics

WEBSITE: www.crest.com.au

PHONE: (07) 3265 0900 **PRICE:** \$299.95

These fellas are pretty expensive, agreed, but they're so good. Such beautiful sound is rarely heard, or should we say *felt*, on headphones. You see, bar the amazing clarity, the key feature of these 'phones is two vibrators on the back. These sit at the back of your head and produce an effect like a beefy sub woofer. Surprisingly, powered by a AA battery, it survived an entire month of heavy use – without losing any oomph. The microphone is also great quality. Equipped with separate volume and vibration frequency dials.



F DVD2Go MPB680 handheld

SUPPLIER: SATO

WEBSITE: www.satotech.com.au

PHONE: (03) 9899 6333 **PRICE:** \$150

With **DVD burners** hitting the market like a swarm of flies, it's about time VHS kicked its final bucket. Practically any device that has S-Video, composite, coaxial RF or R/L audio RCA connections can be jacked in – uploading video to your machine in no time via USB as DVD, A/V split, MPEG2 or SVCD format. Equipped with an internal TV tuner, all the cables (bar coax), DVD authoring software (PowerProducer 2) and a funky flat IR remote, you really can't go wrong with this.



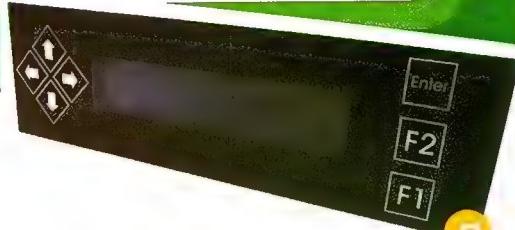
E Matrix Orbital MX212 LCD

SUPPLIER: PC Case Gear

WEBSITE: www.pccasegear.com.au

PHONE: (03) 9568 0932 **PRICE:** \$175

Rheobuses are rather common these days and there's barely any innovation. Well this is among the cream of the crop, apart from looking a tad ugly. As per usual, it can interface with four fans and temperature probes, but that's not the big shot jaw dropper. Not only can it check your email accounts and mobo/CPU temperatures but it displays framerates, info on playing music, network stats, the weather, internal voltages, hell – anything you throw at it – as it's fully configurable. Pricey, but oh-so worth it.

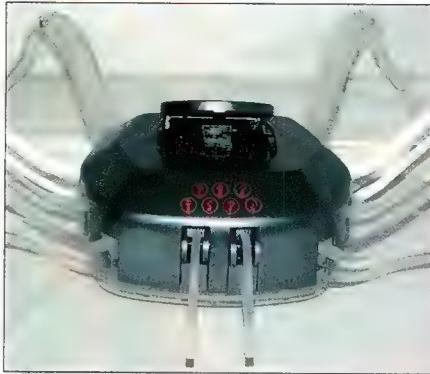




Hotbox



Alex's Spider Case



Technical details

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- Each leg lit with superbright LED
- Spans four feet
- Each acrylic leg is approx 31mm thick
- Wall-mounted
- Approx one-month to complete
- Severed fingers

The spider took a little over a month to complete. The shell of the case is made from a plastic oil bucket. I used fibreglass resin and bondo to give it the shape I wanted. A lot of time was spent sanding it to the desired shape.

As I was cutting lengths for the acrylic legs with a table saw, I managed to get my middle fingertip chewed up, followed by routing my thumbnail off. It took me a few times to learn my lesson, so I had the rest of the work done at

Tap Plastics. And I managed to finish the rest of it with my one good hand.

Since it's so big, it isn't very practical for a regular case. I decided to mount it on my wall to scare my friends. I love the reaction it gets when I say 'it's a computer!' They tell me I waste too much time on cases, which I must say is true. Now the problem I have is seeing if I can top this. But I'll keep the next project a secret for now. . .



G33k Ninja's Midnight Marauder



Technical details

- Athlon XP 2000+ (1.67GHz @ 1.81GHz)
- Zalman CNPS-6000Cu CPU cooler
- ASUS A7V333
- 768MB PC2100
- Albatron GeForce4 Ti4200 @ 300/600MHz
- Promise ATA133 IDE controller
- Two 60GB Maxtor ATA133
- 16x Pioneer DVD slot
- 48x/40x/12x Lite-On burner
- Two blue cold cathodes
- El-cheapo temperature display
- Biohazard appliquéd and fan grill
- Modded Lian Li PC-86

While there are a variety of vampires, the Moravian, which discards its clothes and feasts naked, is possibly the queerest.

I'd been drooling over case mods for months after I got my Lian Li, but I didn't want to mod it because of the risk involved. So I started with rounded IDE cables, wire looms etc. After finishing up with the insides, I became addicted! Armed only with my humble tools, the next task was the back panel. I drilled out the rivets and cut a replacement out of Perspex.

The top window was an impulse, but I think an effective one. As for the image in the side panel, it all started with the original

MechWarrior. Being one of my all-time favourite games, I decided that that was the way to go. After downloading an image, it took two weeks to bring out as much detail as we could without making the segments too small. From there, the image was exported to CAD and sent along with the side panel to the laser cutters (many thanks to Advanced Cutting Technology). To finish it off, I mounted a piece of Perspex behind the cut to stop dust getting in.



Brett's MEMA 600



My Hot Box started life as a cheap Compaq Presario 500! I wanted to upgrade so I went to my local dealer. I started by changing my video card so I could play GTA3 and six months and a lot of money later here it is – the MEMA 600.

The box is an icute but I have installed two rainbow fans (out of a total of seven fans) in the top, plus one on the side covered with chrome fan grills. I installed a cathode strip inside and a backlit temp gauge in the front along with a front cathodes.

I found due to a very warm bedroom my PC would get quite warm inside, especially with the radiator stuck in the box, so I reinstalled the water cooler by re-routing the pipes through the rear of the PC and that has helped. The IDE and FDD cables are blue with the Gigabyte motherboard giving it a range of colours inside.

PS: I would like to thank Jason and Davie for the mods and upgrades!



The Carlos Reactor



I knew a clear plastic case would be the coolest thing to look at, especially if it was enhanced by some well-placed lighting and some good internal 'organs'. The initial build took me about six hours and the 'tweaking' is still an ongoing process.

The most difficult thing to do was to get all the cables tied up as neat as possible to enhance airflow. I am going to redo them shortly and only use coloured nylon sleeves heat-shrunk at each end.

The water cooling works a treat with the heat exchanger (radiator) doing a good job cooling the CPU (~10°C less than standard Intel HSF at full load) and the five other auxiliary fans keeping the box nice and cool.

I had to drill a few holes on the top panel to accommodate the switches for the cold cathode exhaust fan on the top panel and the blue front panel lights. It looks awesome in the dark.



Hotbox of the month wins the 4BIT NF7-SV1.2!

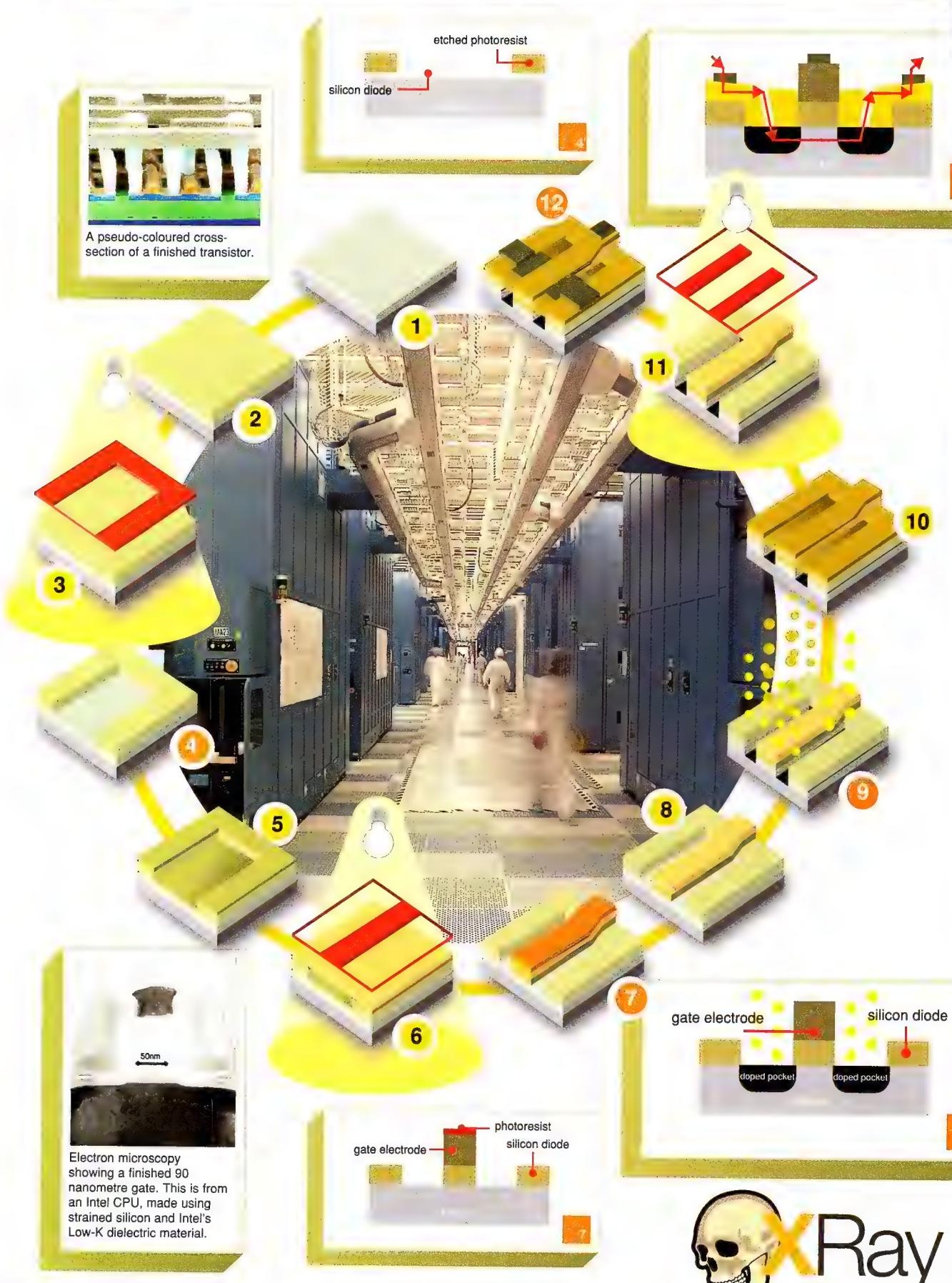
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X-RAY Atomic assembly



Electron microscopy showing a finished 90 nanometre gate. This is from an Intel CPU, made using strained silicon and Intel's Low-K dielectric material.



John Gillooly

Atomic assembly

90 nanometres is small, damn small. John Gillooly is big, and so are the challenges faced as semiconductors keep shrinking.

The circle of silicon life

1. A layer of SiO₂ is grown on the wafer
2. The first layer of photoresist is laid down
3. The first masking stage
4. Exposed photoresist is etched from the wafer
5. A second photoresist layer is added
6. The second masking stage
7. Exposed photoresist is etched to form the gate
8. Photoresist is removed from gate
9. The source and drain areas are doped
10. The third masking stage
11. The metal layer is added
12. The metal is etched to form the interconnects

Like sands through the hourglass, silicon process technology is moving forward at a steady rate. Every year or so we hear talk of some company or another moving to smaller and smaller processes, with Intel now producing CPUs at 90 nanometres and other semiconductor manufacturers preparing to follow suit.

It is a steady march that's been occurring for almost half a decade now, as new process technology needs to be found to keep the transistor-doubling predictions of Moore's Law ticking away. For a while there it seemed like manufacturers would smoothly transition processes every year or two, but as process technology approaches the atomic level, more and more obstacles need to be overcome in fabrication and design.

We saw this in the transition of companies to 0.13 micron fabrication last year. While Intel managed to get it right early on with the 0.13 micron Northwood core for the Pentium 4, others did not enjoy as smooth a transition. AMD's first 0.13 thoroughbred Athlon XP CPUs ran hotter than John Howard in a thong bikini, and NVIDIA's earsplitting cooling solution for its heat pumping GeForce FX 5800 Ultra has become a thing of geek legend.

As companies now look towards 90 nanometre processes, the issues just become magnified and it is taking some tricky new technology to keep semiconductors running smoothly when they're constructed so finely. To understand how and why these new techniques work, you need a basic idea of how semiconductors are made.

Silicon rocks

Silicon is an amazing chemical element. It makes up 27.7 percent of the weight of the earth's crust and its properties have been utilised for some of humanity's most important technological advances.

The silicon used to make semiconductors starts out as quartz sand. However, the silicon used in chip making needs to have a pure crystalline structure, in which each of the four bonds on the silicon atom join to neighbouring atoms to form a pure silicon lattice.

To create the pure silicon wafers that form the foundation for semiconductors, this lattice must be created. To do this, a rod with a silicon crystal – called a 'seed crystal' – is placed into a solution of molten silicon. This seed crystal is then slowly drawn out of the silicon in a process called 'seed pulling', which forms a giant silicon crystal, called an ingot.

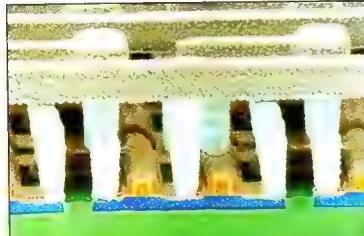
This large, heavy, silicon ingot is then sliced, ground and polished into thin cross-sections called wafers. However because silicon is a semiconductor, and cannot natively carry a charge, it sometimes needs one more step before transistors can be constructed on the wafer surface, a process called doping.

Dope dealing

If we hark back to basic chemistry, you may remember that for a compound to conduct electricity it needs available bonds for electrons to attach to. Because silicon's four charges bond perfectly in the lattice form it is a very poor conductor of electricity, which is beneficial because it allows the manufacturer to control the flow of electricity through the die, thanks to the process called doping.

Doping involves the addition of new atoms to the silicon wafer in order to change its electrical properties. There are two types of doping. The first is called P-doping and it involves impregnating the surface of the silicon wafer with atoms of boron or gallium. These elements have only three electrical bonds, so when they are introduced to the silicon it gains a net positive charge, hence the name P-doping. It is this process that the wafer undergoes before the initial growth of silicon dioxide.

On the flipside is N-doping. This involves the introduction of either phosphorous or arsenic to the wafer. These elements have five bonds, and so when they bond with the silicon lattice there is one bond that's left over, which gives the section of wafer a net negative charge.



ABOVE: An image from IBM showing transistors on an SOI (Silicon On Insulator) wafer and the copper interconnects between them.



Laying the foundation

While modern semiconductors are complex beasts, the basics of fabrication are the same across varying structures and die sizes. Creation of a chip involves several layering processes to build and connect the various transistors needed to crunch that binary data.

The process starts with the thin silicon wafer that has been sliced from the ingot. Because of the nature of semiconductor manufacture, larger wafers are more economical to work with, hence most advanced processes use wafers that are 300mm in diameter. Before work starts on the chip itself, the wafer is P-doped, giving the wafer a mild positive charge that will let current flow across transistors once the chip making process is finished.

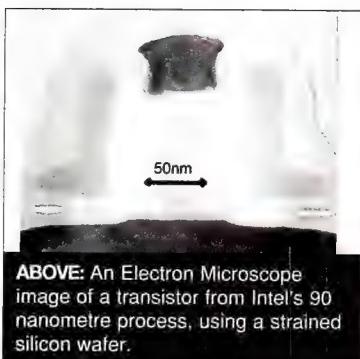
To kick off the chip-birthing procedure, the wafer has a layer of silicon dioxide grown upon it. This layer helps to protect the silicon substrate and provides a foundation for subsequent steps in the process. A layer of substance called photoresist is then smeared over the wafer.

A mask that contains a top-down plan of the chip is then placed over the photoresist. Then the whole wafer is exposed to ultraviolet light in a process called photolithography. Areas of photoresist that are not masked react with the light and can be washed away in solvent. The wafer is then baked to solidify the photoresist that is under the mask. This leaves a pattern of ridges across the surface of a die, with exposed areas of silicon dioxide that can then be etched from the surface of the CPU. After this, the rest of the photoresist layer is removed, leaving a pattern of silicon dioxide ridges over the re-exposed silicon wafer surface.

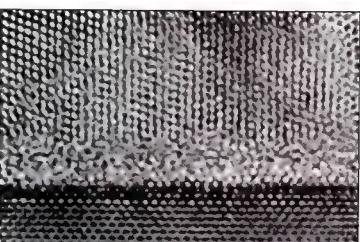
A second layer of silicon dioxide is then deposited and covered with a new layer of photoresist. This is then covered with a different mask, exposed and etched to leave a new pattern of silicon dioxide on the wafer, overlapping the first pattern. This leaves only some areas of the wafer exposed, ready for the next doping session.

Each transistor has two such patches, called the source and drain areas. A process called ion deposition is used to N-dope the exposed areas of silicon, creating what is known as a NPN junction.

What is left is the basic patchwork of unconnected transistors that then need to be joined together. Another layer of photoresist is laid down and masked to create an insulated layer with small windows into the source and drain areas. The whole arrangement is then covered with a thin layer of metal, traditionally aluminium.



ABOVE: An Electron Microscope image of a transistor from Intel's 90 nanometre process, using a strained silicon wafer.



ABOVE: An extreme close up of the gate electrode/wafer interface. Each dot is a single atom, and the thin middle layer is the gate dielectric.



ABOVE: The 0.13 micron Pentium 4 Northwood core, the end result of the CPU construction process.

This metal layer is then masked and etched, with the end result being a series of metal interconnects between the transistors, plugging into not only the source and drain, but also the gate.

This connection to the gate is important, because it is the application of a small charge to the gate that induces electron flow from the source to the drain. And it is by controlling the charges to gates across an entire die that modern computing works.

The wafer then goes through many more stages of masking and laying down of metal interconnects. Once the wafer is completed, each die is tested and subsequently sent for packaging.

Size is everything

This is a simplification of the manufacturing process, but at heart it is how all semiconductors are made. However, as the drive for smaller and smaller processes continues, new challenges are thrown up that need innovative techniques to be developed to overcome them.

We are currently on the cusp of the transition from 0.13 micron to a 90 nanometre process, and doing so brings a whole new raft of problems. A lot of these stem from the fact that structures within transistors are getting so small that there is a natural tendency for electrons to arc across gaps – like that between the source and drain areas. Thus, another problem that arises is that this sort of electron leakage can cause serious heat problems in the resultant core.

These specific problems have a huge potential impact on the end product, such as the Thoroughbred and GeForce FX 5800 heat problems. So, rather than design a cooler that could propel a monkey into space, it's best to fix the problem on the die itself, reducing overall heat output and making for a better performing chip.

Solutions range from generic concepts to specific techniques used by different semiconductor manufacturers. Some were introduced with 0.13 micron processes; others are being used by Intel in its production of 90 nanometre cores; and still more will come into play as other companies move to 90 nanometre processes.

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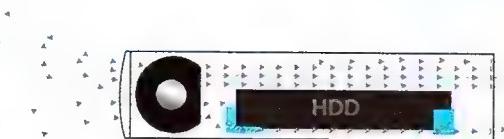


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Air Flow Diagram:



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- ▶ Adjustable fan speed (High, Low, OFF)
- ▶ Temperature display in °C /°F
- ▶ Replaceable filters to reduce dust build up
- ▶ Compatible with all 3.5" hard drive
- ▶ Fits in a standard 5.25" drive bay
- ▶ Includes 3 dust filters

SPECIFICATIONS

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- ▶ Weight: 750 g
- ▶ Rated Voltage: 12 V
- ▶ Rated Current: 0.1 A
- ▶ Fan Speed: 2000 ~ 3700 RPM
- ▶ Airflow: 16 ~ 30 CFM
- ▶ Noise Level: 28 ~ 38 dBA
- ▶ Fan MTBF: 30,000 hrs
- ▶ Bearing Type: Ball Bearing

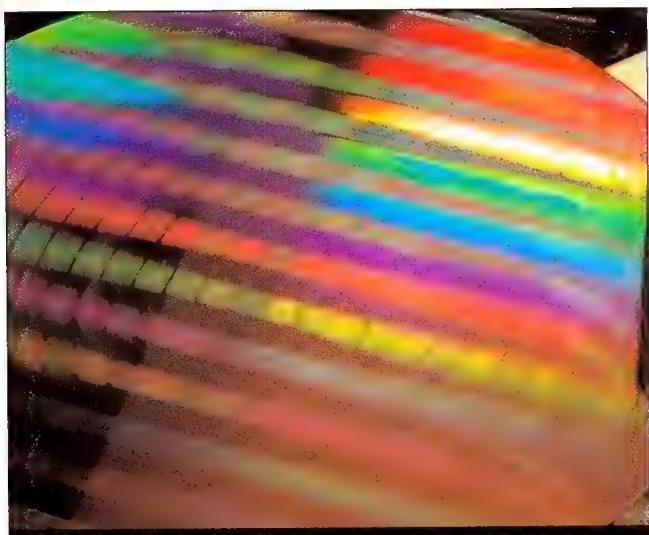
Model:



VTX-C01-BK (Black)



VTX-C01-SL (Silver)



ABOVE: The creation of a whole wafer's worth of transistors is a many-staged process. This wafer is being spun to dry it out.

Resistance is futile

The two most talked about solutions to 0.13 micron core dilemmas are copper interconnects and Low-K dielectrics, both of which are now in common use. The transition from aluminium to copper has been long awaited and posed significant challenges in its implementation.

Copper is needed because as transistors get smaller the metal interconnects get narrower and can carry less current. This is a major issue because it is the speed of the interconnects that ultimately determines the processing speed of the microprocessor. Copper has an advantage over aluminium because it has two-thirds the electrical resistance and so it's a much more effective material when stretched thin.

The reason that copper was not used before now has been that it has problems with a peaceful co-existence with silicon. It has a nasty tendency to diffuse into surrounding silicon, which can cause short circuits and hence kill the usefulness of the core.

To get around this issue with copper, it needs to be wrapped in an insulator. These materials are called dielectrics, and are of the utmost importance to modern process technology.

There are two types of dielectric used in semiconductors; High-K and Low-K. The terminology describes the capacitance of the material relative to the silicon dioxide used as the gate oxide in CPUs. Low-K dielectric materials have a capacitance lower than silicon dioxide and are used to insulate interconnects, preventing crosstalk between wires.

High-K dielectric materials are used to replace the silicon dioxide as the gate oxide, and are of increasing importance as gate oxide widths get smaller and smaller (in the case of Intel's 90 nanometre process, gate oxides are only five atomic layers wide). So, even though the sexier Low-K dielectrics get all the press, High-Ks are the ones to watch for in future.

By replacing aluminium with copper and implementing Low-K dielectrics properly, manufacturers can theoretically squeeze the same heat output and power consumption out of interconnects under half the size.

The other problem found when shrinking the die size is that the energy needed to charge up transistors increases due to

leakage where the source and drain areas touch the underlying silicon. These areas are called junctions and are a major source of power leakage as process size decreases.

To combat this leakage, work has been done on a technology called Silicon On Insulator (SOI). In SOI wafers the junction sits directly on top of an insulating material, which stops power leaking from the junction and reduces total power consumption of the CPU by a significant amount.

SOI has been a big sticking point in the industry and is yet to be used for production microprocessors. The problem is getting the layer of insulator into the perfect crystalline structure of the silicon wafer. Previous techniques failed because crystalline silicon by its very nature does bond very well with other substances, so the challenge has been to introduce a layer without damaging the wafer.

So far IBM has successfully approached the problem through a process called Separation by Implantation of Oxygen (SIMOX), in which oxygen atoms are introduced to the wafer to create a layer of insulating silicon dioxide at the correct depth. This technique is still slowly plodding towards production with its licensee AMD, and should appear in the 'San Diego' and 'Paris' CPU cores that AMD's roadmap has slated for release next year.

Intel has taken a different approach to smoothing electron flow across gate areas, using a technique called strained silicon. This works almost exactly as it sounds; the silicon lattice in the wafer is stretched out slightly by growing it on a layer of silicon-germanium. The combination of silicon and germanium is used to leverage the fact that it forms a wider spaced crystalline lattice than pure silicon. When silicon is then grown on top of this layer, it mimics the wider atom spacing. This reduces the density of atoms within the wafer, allowing current to flow easily through the lattice. This technique will first make its appearance with Intel's Prescott and Dothan processors sometime early in 2004.

Intel also recently announced a fundamental material change that will occur with the debut of its 45 nanometre process in

Intel has taken a different approach to smoothing electron flow across gate areas, using a technique called strained silicon.

2007. This involves changing the gate oxide from silicon dioxide to a High-K dielectric material, which stops problems with leakage. However this requires new materials for the gate electrodes in order to get the voltages high enough for the transistor to operate smoothly.

Mask of light

Fixing the electrical problems with the transistors is only part of the problem with current process size. Problems are also arising with the precision of the masking process, as structures are getting smaller than the light wavelengths used to create them. This has led to research into new methods of lithography, and tricky techniques to squeeze the most out of current techniques.

Currently the masking process is done using lasers operating in ultraviolet wavelengths, using lenses to focus the beam. However, as the needs of semiconductor manufacture move beyond this process, attention is turning to radically different methods to make finer and finer structures.



X-RAY: Atomic assembly

As a stopgap, companies like Intel are using tricks with masking to increase the accuracy of current techniques, but in the long run a wholesale shift in the process is needed to make reliable structures smaller than 50 nanometres.

To do this an industry consortium is working on a technique called extreme ultraviolet lithography (EUV). Led by Intel, this consortium features such heavyweights as IBM, AMD, Infineon, Micron and Motorola and is looking to debut its technology in the second half of this decade. EUV uses light capable of producing structures only 13 nanometres wide, but comes with one downside. The light is at such a fine wavelength that not only is it unable to travel through air; it cannot be focused by even the finest of glass lenses.

To combat this EUV uses light generated by excited Xenon gas, rather than fired from a laser. To narrow and focus the wavelength, the light is bounced off a series of mirrors, which gets the beam down to the 13 nanometres needed for future process technology.

Actual deployment of EUV is still a long way away, but when you consider that microprocessors have been made using the same photomasking techniques since the industry began, it will be one of the most fundamental shifts to come to the industry.

The diamond age

One of the major characteristics of semiconductor manufacture is that whenever physical boundaries are reached, new technologies will come onboard to get around them. By subtly



ABOVE: While we suspect it is some sort of weather ray, this is allegedly a key piece of EUV machinery.

altering how chips are made, the steady march of Moore's Law can continue unabated.

Process leaders like Intel and IBM are already looking beyond 90 nanometres towards 65 nanometres, which will become the new process standard in the 2005-2006 timeframe. At its recent Developers Forum, Intel displayed electron microscopy of prototype transistors manufactured not just for 65 nanometre cores, but also for 45, 32 and 22 nanometre processes, taking the biennial process shift all the way to 2011.

It seems as if the rate of development will indeed continue unabated for the foreseeable future, but at some point silicon will reach its limits, and the straight trade-off of process size for microprocessor complexity and speed will start to fail.

It is this awareness that's driving the search for new semiconductor materials. In the near term this involves looking

into techniques such as those talked about in this article, but in the long term it will involve looking at new materials to build CPUs from.

In the periodic table there is only one element whose chemical properties are better for semiconductor manufacture than silicon, and that is carbon. Unfortunately making crystalline lattices of carbon is rather difficult, usually requiring immense heat and the kind of pressure that used to only come from two continental plates rubbing against each other. This crystalline form of carbon is known as diamond.

While the manufacture of artificial, industrial-grade diamonds has been around for some time now, it is only recently that techniques for building large crystals have been developed. Potentially, once this crystal growth process reaches the point of financial viability it will also be ready for use in the manufacture of microprocessors, especially now that scientists have demonstrated the ability to dope the diamond lattice with boron, breaking through the fundamental boundary to transistor construction.

Silicon is set to remain as the foundation to computing for some time to come though, with major semiconductor firms saying that they will need a decade or so to evaluate such a fundamental shift as moving away from silicon to diamond. But as semiconductor firms continue to take us to the very cusp of silicon's possibilities, diamonds could end up becoming the geek's best friend.

The changes being made to silicon processes seem tiny, but in the scheme of things they are as fundamental as the shift from valves to semiconductors many years ago. As we begin to manufacture structures smaller than living cells, new challenges keep arising that will require methods that probably haven't even been thought of yet. It is one of the least visible revolutions occurring within the industry, but it's perhaps the most important - for it is through advances in process technology that the fundamental pace of Moore's Law can continue unabated.

Small world

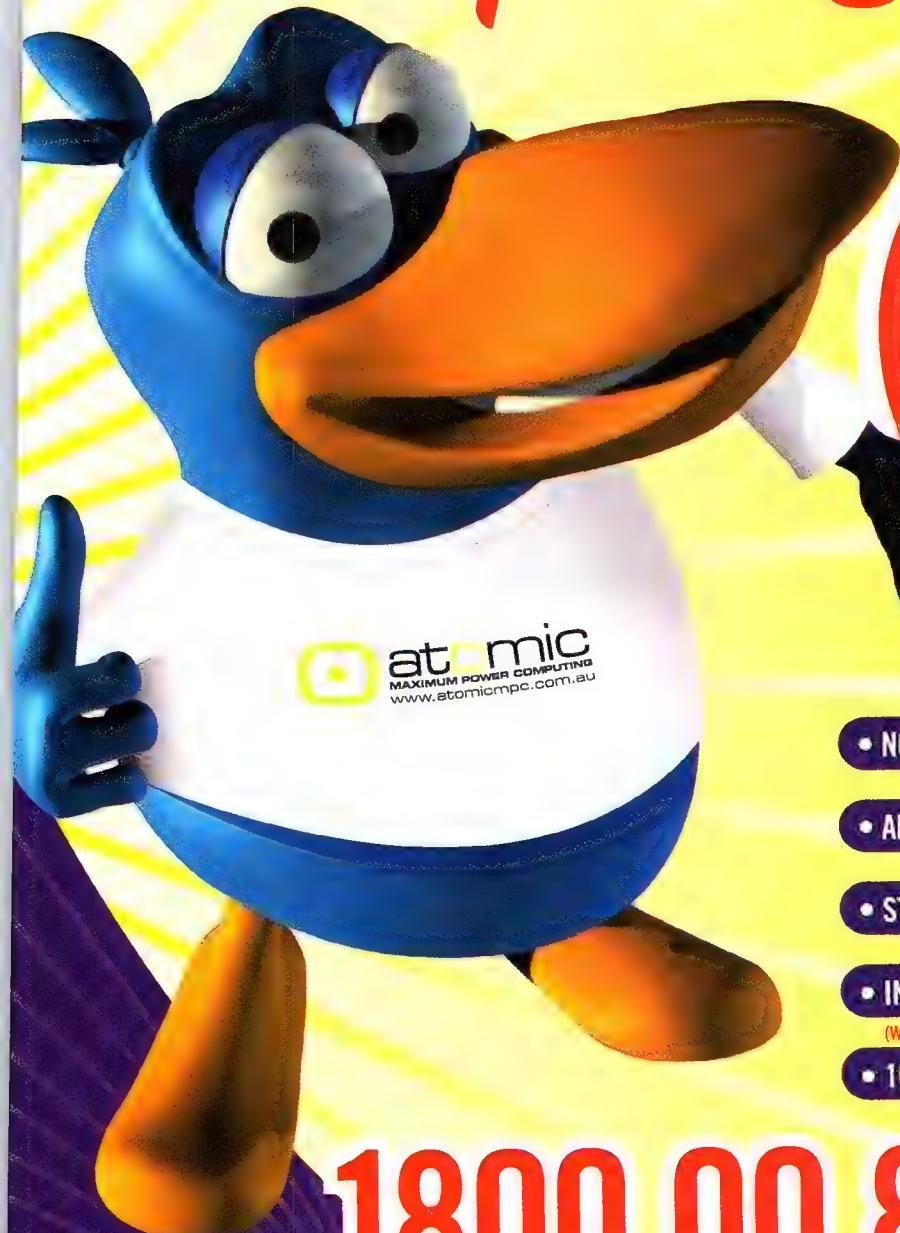
CPUs based upon Intel's 90 nanometre process are yet to hit the retail market but already the chip maker is looking forward to 2005 and the next big leap. Intel has just announced that it has constructed working SRAM (Static Random Access Memory) chips on a 65 nanometre process.

SRAM chips are commonly made as proof of technology by Intel, it allows for the process to be refined while perfecting useful structures (SRAM is used for CPU cache memory). Its first 90 nanometre proof of concept was with SRAM as well.

While most of the new process technology has come in with the 90 nanometre process being used for Prescott, 65 nanometre brings with it the second generation of Intel's strained silicon technique paired with copper interconnects and Low-K dielectrics. It also has transistors with a gate length of 35 nanometres, up from the 50 nanometre gate length achievable with 90 nanometres. Most of the trickery comes from the use of new mask technology, called OPC (Optical Proximity Correction), to enable accurate structures with such short light wavelengths.

Production at 65 nanometres is scheduled to begin in 2005 on processors that are yet to be discussed. Initially production will centre upon Intel's newest 300mm wafer Fab, D1D, which is located in Hillsboro, Oregon, US. D1D is Intel's fourth 300mm wafer facility and it has been built to construct CPUs at both 65 and 45 nanometres.

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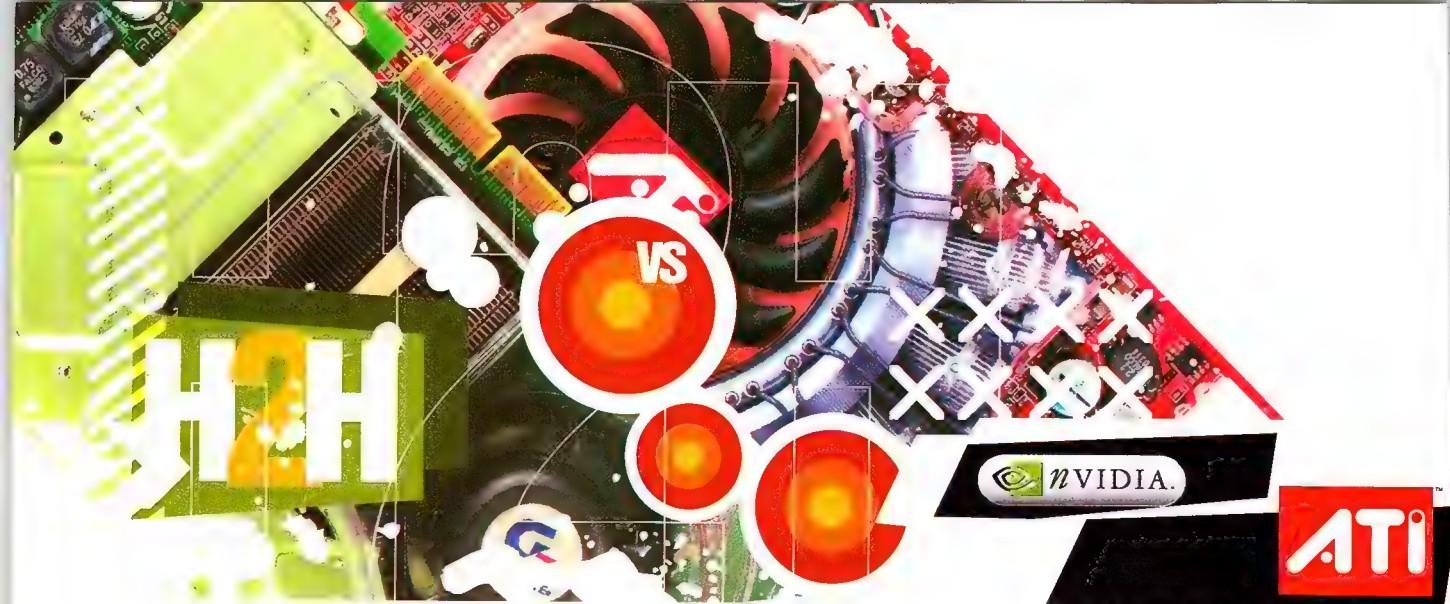
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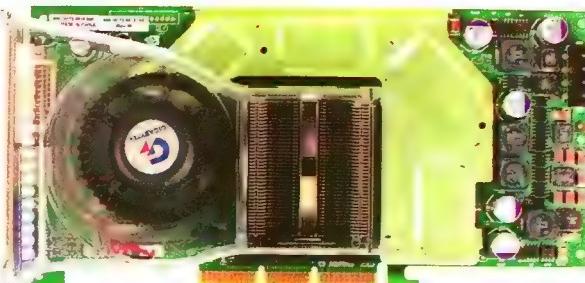
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RADEON 9800XT vs GeForce FX 5950

Nathan Davis and John Gillooly play lightsaber fights with the fastest video cards to date.

the contenders



Apparently, bird's-nest soup is an aphrodisiac – as long as you can stomach it.

Fter a brief flirtation with synchronous product launch and availability, the graphics industry has tumbled back into the realm of paper launches. It took over a month from ATI's announcement of the RADEON 9800XT for cards to enter Australia, and it has been even longer for the mid-range 9600XT. NVIDIA did things a little quicker, managing a two week turnaround on the GeForce FX 5950 and only a little longer for the 5700 Ultra.

Now that the delays have ended, we can finally line these two new flagship cards up against each other. We will see how performance differs in this final refresh of the NV3x and R3xx series of video cards. It now looks like ATI will announce its R420 and R423 products and NVIDIA its NV40 sometime during the first quarter of 2004.

It will be with the introduction of these products that the market will undergo another shift. This generation has not been the best for NVIDIA, which gambled on a custom hardware implementation of DirectX 9.0 and got shafted by ATI's pure DirectX 9.0 shader design. However, these companies are not run by idiots and with DirectX 9.0 relatively stable it would be naïve to expect to see NVIDIA make the same mistakes again.

At the moment ATI has the better shading unit in the high end. An NVIDIA card requires developers to use more custom code and mixed shader versions to get it flying at full speed, and when shown the much easier option of pure DirectX 9.0 *a la* the RADEON they will naturally prefer it.

But with the next generation it is a reasonably safe bet that shader performance will level out between companies and the market will become a lot more interesting. NVIDIA has clawed back a chunk of the raw performance ground lost with the GeForce FX 5800 Ultra, and once the major architectural changes of a new generation come online they should be able to match ATI's performance (ATI has publicly talked about a target of double the performance of the RADEON 9800XT for the R420) in a much more equitable way than now.

To gauge the performance of the RADEON 9800XT and GeForce FX 5950 Ultra we have tested them extensively with our new benchmarks. In the left corner we have Powercolor's RADEON 9800XT, already standing a little taller thanks to the inclusion of Half-Life 2 (when it is ever actually released, probably March or April 2004) via a redemption voucher. In the right corner, we have Gigabyte, newly returned to the NVIDIA fold with its GeForce FX 5950 Ultra card.

Both cards have been tested using our Athlon 64 3200+ testbench, with an ASUS K8V motherboard and 512MB RAM. The tests were run using Windows XP with SP1 and DirectX 9.0b. The RADEON 9800XT was tested with CATALYST 3.9 drivers while the GeForce FX used NVIDIA's ForceWare 52.16 drivers.

Aesthetics

The 9800XT is one of the weightier cards ATI has released – this is due to the swanky new all-copper heatsink, which is made up of several plates of square-folded copper. On the other side of the fence, the FX5950 Ultra isn't quite as heavy, as it has inherited the aluminium heatsink design from its predecessors – the cooling system we like to call the lawn blower design. This means the same steal-an-expansion-slot problem still remains, killing off any hope of fitting it in the majority of barebones machines without some kind of drastic surgery. Though admittedly that would look rather swanky.

The 9800XT was damn quiet but the FX5950 Ultra was the noisiest, with its slowest fan speed matching close to that of the highest fan speed on the gloriously peaceful 9800XT. The 9800XT was so quiet it's hard not to be fooled into thinking it uses passive cooling – it barely ever went above its slowest speed even when under full load. With a slower, yet larger fan, the temperature of the 9800XT was cooler than the FX5950 Ultra, with the FX5950 Ultra at times edging on uncomfortable to touch. Because of the advantages of reduction in both the heat and noise, it would seem this copper design should be used more often on video cards.

The gruntmasters

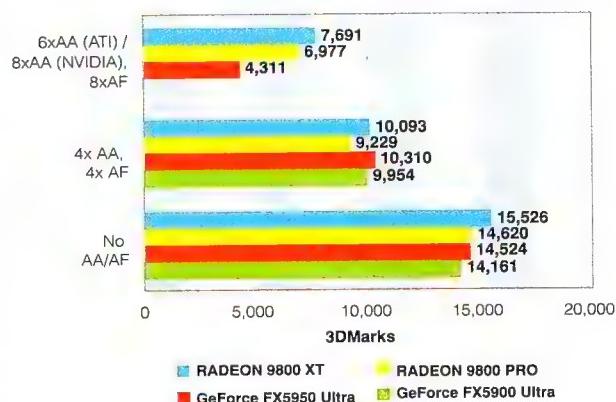
In the past, ATI's new beasts have completely stripped the competition nude. NVIDIA tried to evade this by creating a card that blew our clothes off, but that wasn't impressive enough. Nor was the noise. Over the months, NVIDIA has slowly been creeping closer to the insane performance of the RADEON 9800 PROs, but never enough to fully squish and defeat them. In the last couple of months, it managed to steal a place or two at the top of Framerate but only by small skips and crawls. So, the ultimate question is, has NVIDIA finally done it? Which new beast is superior – the GeForce FX5950 Ultra or RADEON 9800XT?

Peering at the results, you can see pretty much wherever non-prettied-up raw frames are concerned, the FX5950 Ultra really does a fine job – shooting ahead, albeit by a small margin. It stole sides from both theoretical and gaming tests. We're impressed with the results, as this shows NVIDIA has finally got off its arse and done something about the huge lack in performance. But there is still one test it can't quite muster, and that's with 3DMark2001SE. There is a hint of performance though, which shouldn't be boogered at – it appears 4x antialiasing and 4x anisotropic filtering is its sweet spot. This is one of the first instances in which we've seen a GeForce card beat a RADEON by so much when using a decent amount of filtering.

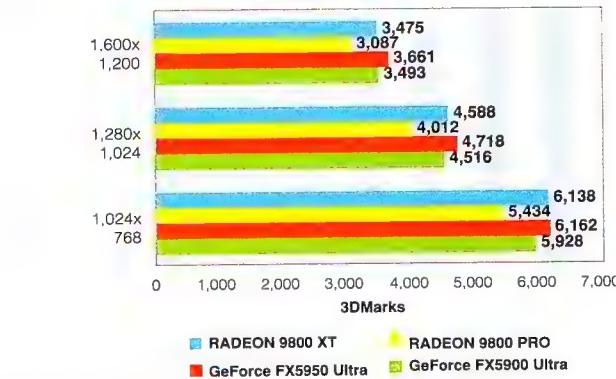
You may notice in 3DMark2001 the FX5900 Ultra is missing the 8x test results. Even though it should have worked fine (8x antialiasing and anisotropic filtering are both supported on this card for both primary graphics APIs – Open GL and Direct3D), for an unknown reason the card promptly ran with antialiasing turned off at this setting, regardless of how much monkey dancing and screaming was done (you really don't want to see us in action). So, not wanting to skew the existing results, we kept the 8x test out of the charts.

With all its controversy, 3DMark2003 Pro is making an appearance, as we believe it is getting to a mature state.

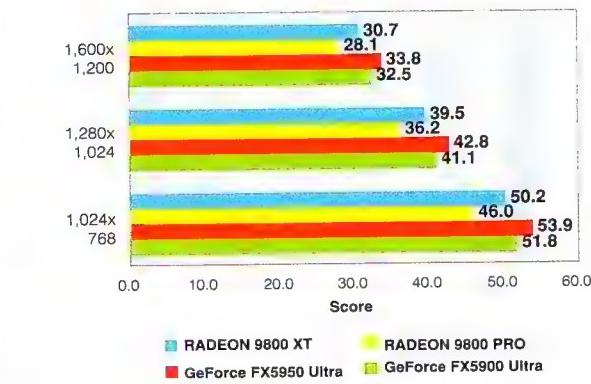
3DMark2001SE - 1,280 x 1,024



3DMark2003PRO



Codecreatures



At the time of writing, release 340 had just been pushed to the public and this one keeps NVIDIA's 52.16 Forceware (the drivers are no longer known as Detonators) at bay from any cheats (particularly shading) it may attempt to use. Which, might we mention again, is really fucking stupid of NVIDIA. The FX5950 Ultra card still pushed a head in all tests here, so why NVIDIA stubbornly continues to cheat with its drivers is beyond us.

NVIDIA's line pushed ahead in the demanding Aquamark3 and Codecreatures, as the cards did also in Unreal Tournament 2003 – showing a slight edge we haven't seen in quite a while.



Head to Head: video card hoopla

We've also introduced Call of Duty as a benchmark, as it's a game based on a modified version of the Quake 3 engine. As you probably know, Q3A has some damn good inbuilt benchmarking abilities, but it barely manages to stress the video anymore. It has aged and is now only good for benchmarking CPUs. On the other hand CoD does stress the video with larger textures and higher polygon counts, among other custom enhancements. Into the toolbox it goes.

As mentioned, NVIDIA cards usually suffer when it comes to antialiasing and anisotropic filtering. Though showing a boost in 3DMark2001SE, this really hasn't changed all that much, as made evident on CoD. It displayed the dip in performance – although remember the two high-end results are not directly comparable. Between the two cards, when set to medium filtering quality, there is a 7.2 percent difference. It's closing, but that's still a big gap.

We were just finishing off some final tests on our reference RADEON 9800 PRO and as the lab-dwelling luck-apes would have it, it decided to go screwy on us. Entire game worlds turned to a garbled mess of artefacts, vertical lines randomly appeared on-screen and the games simply didn't want to know about the card any more. It was possibly a heat problem, but we were unable to get it chugging again no matter what we did. We've included the results squeezed out prior to its demise, but were unable to make it complete the CoD tests. Let us now take a few humble moments to... liquefy the blighter for next month's cover.

Incredibly, NVIDIA's FX5950 Ultra pulled ahead for the good majority of the tests, particularly those not related to pretty filtering but to pure, unadulterated frames. The 9800XT was merely a few points below, however it displayed a far prettier picture. Antialiasing and anisotropic filtering still don't cut back performance on the RADEONs nearly as much as on the GeForce range. Although antialiasing is a personal preference – many people prefer higher resolutions to the blurring of pixel edges.

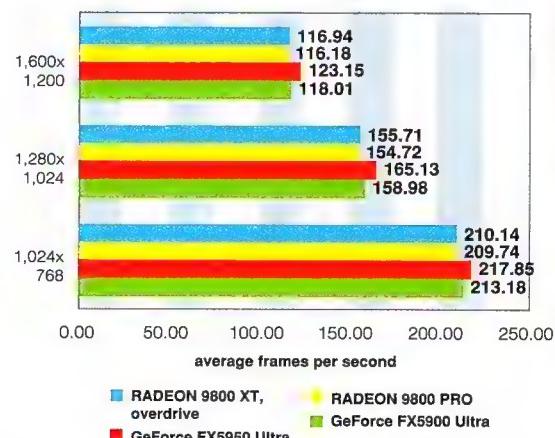
When testing antialiasing and anisotropic filtering, we used both a high stress and a medium one. The reason for this was to provide a decent comparison, as the 9800XT can only reach a maximum of 6x antialiasing, but NVIDIA has given their range of FX cards the option of being pushed right up to 8x antialiasing. 6x can easily be selected, but only works in a Direct3D environment. We could have used it just for that API, but we wanted an outright comparison that would work right across the board, so we went with 8x, with the 4x results actually being directly comparable.

One interesting addition to the new XT cards is the Overdrive function. When enabled, this automatically overclocks the card according to the internal and surrounding temperatures. As you can see from the Unreal Tournament test we did, it doesn't increase performance a hell of a lot, (even in cool temperatures of 21°C) but it's great to see ATI is coming up with these ideas.

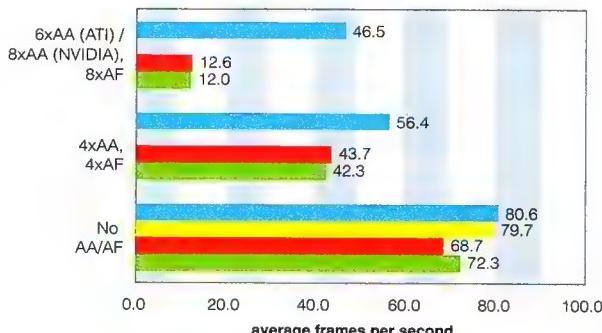
Who scores?

Overall, they're both good cards, but neither is nearly groundbreaking enough to warrant mass hysteria, unlike the RADEON 9800 PRO. The card that scooped up most of the cream, though, was the GeForce FX5950 Ultra. Finally here's a card that NVIDIA can be proud to prance around with. The 9800XT isn't without merit, performing brilliantly

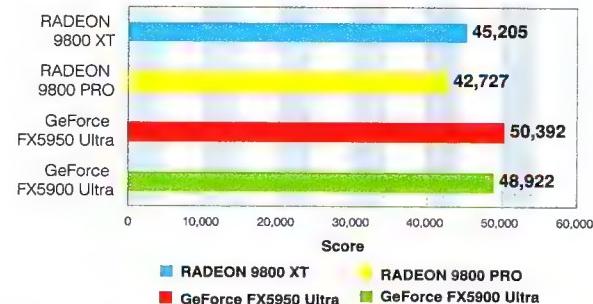
Aquamark 3



Call of Duty - 1,280 x 1,024



Aquamark 3



as expected with both antialiasing and anisotropic filtering set to maximum.

Even if you're richer than a Melville mud cake, these aren't worth the premium. With Gigabyte FX5950 Ultra retailing at \$859 and the Powercolour 9800XT at \$847, a price drop or two may prove these to be worthy of your purchase. Otherwise you can currently scrounge up a damn good deal on a RADEON 9800 PRO for almost half the price – and they're now set to fall even cheaper. For fast and dirty framerates, the FX5950 Ultra keeps the peace. Otherwise, for overall quality, the 9800XT is the better choice. It's silent, has non-slot-stealing mannerisms and prettier, playable graphics. Also, the mere fact that the Overdrive option exists shows that ATI is more willing to innovate. You have the choice of either raw frames or quality.

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A moveable feast

Get mobile with John Gillooly and a new notebook.

It's been a while since we were able to dismiss notebook PCs as underpowered portable typewriters. Notebooks just keep getting closer to desktop systems in performance, while the once-exorbitant pricing becomes more realistic every year.

While notebooks are still entrenched as a business tool, the big boom for manufacturers has been people choosing a notebook instead of a desktop PC. Now that pricing is less offensive, the small size and portability of notebooks are attractive to a huge range of users, which has led to notebooks now accounting for more sales than desktops.

The business traveller is no longer the main focus of notebook design, so several fringe product segmentations have arisen. At the lightest end of the market sit the ultra portables. These are notebooks where the most important factor is minimising size and weight while maximising battery life. These machines are mainly based around ultra low voltage CPUs from Intel and Transmeta.

At the other end of the spectrum sits the desktop replacement. While these are still definitely notebooks, they are relatively heavy and are built with an emphasis on performance. This makes for incredibly powerful hardware but short battery life and they're best used when connected to mains power.

While there is no set notebook form factor, there are two major divergences from 'normal' notebook design that bear mentioning. The first is Microsoft's Tablet PC, which is essentially a notebook PC that replaces the normal input devices with an active digitiser pen. While the implementation of Tablet PC has been great, the uptake rate has been very low as people struggle to see any advantage over either normal notebook PCs or good old paper and pens.

The other rapidly exploding segment is a spin-off of the desktop replacement class. Dubbed 'widebooks', these have stemmed from the home theatre realm and sport wide screens for DVD playback. While some technology spans across the entire notebook market, it is becoming more and more diversified. Hardware is now being developed that targets the power and performance requirements over the range of notebook uses, with the pace of technology increasing as portable computing continues to increase in popularity.

Processor tech

While the constant torrent of market-ese may get a little heavy, there is no doubt that Intel's Centrino initiative has been a success. Not only has the Pentium M CPU set new standards in battery life, pairing it with the Calexico 802.11b wireless LAN chip has driven wireless use to new levels.

At the moment Intel has Pentium M models based on the 0.13micron Banias core running on a 400MHz FSB at speeds from 1.3GHz to 1.7GHz. The CPU features 32KB of L1 and 1MB of L2 cache and also supports the SSE2 instruction set found in the Pentium 4



ABOVE: An ultra-portable notebook.



ABOVE: A desktop replacement.



and Athlon 64 CPUs. The Banias core is due for an update in the next few months with a new core codenamed Dothan, which is constructed with the same 90 nanometre process technology as the desktop Prescott core – using strained silicon and copper interconnects. Architecturally it is similar to Banias, but its 140 million transistors enable a doubling of L2 cache to 2MB. This is more of a core refresh than a new product, with the next generation of Centrino, codenamed Sonoma, not due until late 2004.

Intel recently changed the naming for its Pentium 4 for desktop replacements. Previously known as the Intel Mobile Pentium 4 Processor-M it is now officially the Mobile Intel Pentium 4 Processor or the Mobile Intel Pentium 4 Processor supporting HyperThreading Technology. Functionally identical to the desktop Pentium 4, this processor differs with the inclusion of power management and a lower operating voltage.

AMD has not had a strong presence in the notebook field; it has historically been near impossible to find Athlon-based notebooks until well after launch. Rather than go down the path of Intel and Transmeta and construct a chip purely for mobile use, AMD has a mobile version of its Athlon 64 CPU ready to go, even though the current Athlon 64 notebooks use desktop CPUs.

The mobile variant of the Athlon 64 differs only in the inclusion of AMD's battery extending PowerNow! Technology. AMD's website states that the CPU is optimised to run as a desktop replacement, competing against the Mobile Pentium 4 rather than the Pentium M.

After languishing in obscurity for a while, and now Linus Torvald's free, Transmeta has recently announced the Efficeon. Like the previous 128-bit Crusoe processor, Efficeon is a VLIW (Very Long Instruction Word) that combines with Transmeta's code morphing software to squeeze long battery life and high performance out of the processor. Efficeon is a major update to the architecture. It is now a 256-bit core, allowing it to process twice the instructions per clock, which dramatically increases the efficiency of the processor and enables longer battery life on the ultra portable notebooks that it's destined to inhabit.

Wireless LAN

Running a wireless LAN for desktop PCs is a convenient option for cable haters, but it is in the notebook sphere that Wi-Fi really shines. If your notebook doesn't move around much you won't see the benefit, but as soon as you get on the road you'll start wondering how you did without it.

Despite what television may have you think, the world is not an overlapping series of wireless hotspots – they are concentrated into areas where usage is high. Airports are now littered with people bashing away on the Net, and laptop-wielding metrosexuals seems to be breeding inside every Starbucks in the continental US.

At the moment the most widely installed Wi-Fi technology is 802.11b. One of the cornerstones of Centrino, 802.11b provides 11Mb/s bandwidth and runs on the unregulated 2.4GHz band.

To complement the release of the Dothan CPU, Intel is developing Calexico 2, an 802.11g based chip. 802.11g is backwards compatible with 802.11b hardware but theoretically supports 54Mb/s of data transfer and officially supports 20Mb/s data transfer. While it can interoperate with 802.11b, doing so does impact the speed at which it runs. Late next year as part of the Sonoma update it will bring in a chip that supports all three major standards – 802.11a/b/g.

Because of the sheer industry weight behind the Centrino initiative we can expect most other manufacturers to follow close to Intel in their plans. Because the success of Wi-Fi relies on infrastructure in the form of access points, it makes little sense to divert from the mainstream if you want your product to succeed.



ABOVE: A new generation widebook designed for the digital home.

Mobo tech

Historically, mobile chipsets have lagged behind desktops by a fair margin. It took a long time for things like DDR memory to make an impact on the notebook world, but things are changing fast. At the moment there are two players who are really pushing the boundaries of how we look at mobile chipsets – NVIDIA and Intel.

Leveraging the runaway success of the nForce branding, NVIDIA has created the nForce3 Go Multimedia and Communications processor for the Athlon 64 and Efficeon CPUs. Both of these CPUs feature integrated memory controllers, so NVIDIA has been able to come up with a single chip solution for both architectures.

The nForce3 Go 120 is the chipset designed for ultra portable PCs that use the Efficeon CPU. This is a streamlined MCP designed with power minimisation in mind. It supports isochronous data transport, USB 2.0, multi-channel AC'97 audio, HyperTransport and NVIDIA's PowerMizer technology. While not as fully featured as most notebook chipsets, the features are targeted perfectly at the unique needs of ultra portable users.

For the Athlon 64 NVIDIA has pumped up the features with the nForce3 Go 150. Aside from power management technology this MCP is functionally identical to the desktop nForce3 chipset.

Intel's most advanced notebook chipset is the 855GME. This pairs the 400MHz FSB of the Pentium M with DDR200, DDR266 or DDR333 running in a single channel configuration. It also features Intel's Extreme Graphics 2 running at 250MHz for people who expect to never play a game in their life. There is also an identically specced 855PM chipset that dispenses with the integrated graphics and adds a 4x AGP controller.

While desktop users are currently enjoying Intel's Serial ATA supporting ICH5-R Southbridge, the 855GME uses the ICH4-M chip. This is functionally identical to the desktop ICH4 with support for USB 2.0, but it adds notebook specific power saving options.

Sonoma will next year bring a huge range of new functions to Centrino. Part of this is a new chipset codenamed Alvisio, which looks on paper to be a generational leap in technology, bypassing the ICH5-R Southbridge altogether (from reading the specifications it appears to use Intel's rumoured ICH6 Southbridge that is due for release sometime next year). Instead a new Southbridge will be introduced with support for PCI-Express, DDR-2, SATA and the AC'97 replacement Azalia audio interface. It will also be the first chipset supporting the new PCMCIA replacement, ExpressCard.

Display tech

Besides the performance that trickles forth from better notebook CPUs, the other big driver of the desktop replacement segment has been the rapid advances in mobile graphics chips over the past ▶

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MOBI
TECHNOLOGY



few years. While Intel is well and truly focused on getting a decent onscreen display with its Extreme Graphics, both NVIDIA and ATI have been pushing the boundaries of laptop gaming.

ATI is targeting its Mobility RADEON 9100 IGP at the same market as Intel's 855GME chipset. We have looked at the desktop version of ATI's chipset and it delivers impressive graphics performance for an integrated solution, dwarfing the Extreme Graphics 2 but still not performing as fast as a decent discreet graphics solution.

Discreet graphics solutions for notebooks are not lagging far behind desktop graphics cards in performance. There is a range of DirectX 9.0 solutions on the market; ATI currently has the Mobility RADEON 9600 at the top of its range, and NVIDIA has recently announced the GeForce FX Go 5700. Because of the necessity for power optimisation these chips are not as fast as the desktop versions, but the performance gap isn't huge.

Recent leaps in graphics performance have been enabled because it is now feasible to give notebook graphics chips dedicated memory. A chip that relies on a dedicated chunk of the system's main memory ends up bottlenecked by the system's memory bandwidth, but by strapping dedicated RAM to the chip package, graphics makers have been able to make use of advanced memory controllers to boost performance.

While the rise of mobile gaming performance has played its part, just as strong a driver has been the use of notebooks as digital media players. Digital video has been even more of a breakthrough technology for gaming, especially with the rise of DVD. Just like on the desktop, NVIDIA and ATI both include hardware enhancements for video. ATI not only has hardware MPEG 2 acceleration built into its chips, but it also has its FULLSTREAM deblocking technology for enhancing compressed video. NVIDIA has just debuted the mobile version of its Video Processing Engine (VPE) version 3 with the GeForce FX 5700 Go, and its other mobile GPUs use VPE version 2. This is, at heart, MPEG 2 acceleration combined with tools to improve image quality.

While the majority of the notebook video market is in the hands of Intel and ATI, and to a lesser extent NVIDIA, there is another player. Newly-formed XGI has the Volari XP5. This chip was called the XP4 before it was acquired as part of XGI's buyout of Trident. The Volari XP5 is focused on low power and, while it has hardware support for DirectX 8.0, it is less featured than the NVIDIA and ATI offerings. Next year XGI will merge its desktop and notebook architectures to form the first pure XGI graphics chip – a solution potentially competitive with the rest of the market.

Hard drives

Notebooks bring very specific challenges to the storage market. Not only are the power consumption concerns of utmost importance, notebook drives need to be significantly smaller than their desktop cousins and as drives are incredibly sensitive to vibration they must also cope with the rigours of movement.

For these reasons laptop hard drives were stuck at 4200Rpm for many years, with Hitachi and Toshiba releasing 5400Rpm models last year. Recently Hitachi became the first to ship a 7200Rpm notebook hard drive for the desktop replacement sector.

Serial ATA is not currently present in the notebook arena, even though the specifications have been designed so that the same cabling and power requirements flow from 3.5in desktop drives to 2.5in notebook drives, and thinner cabling is a boon for cramped notebook internals. SATA will not make much of a mobile splash until Intel releases the Alvisio chipset next year.

The whole package

As notebooks continue to increase in power and popularity there is the potential for them to challenge the role of the desktop PC, however there are still some major differences between the two. The first is upgradeability. Modern notebooks have a lot more room for upgrading than they used to. While most notebooks allow for memory upgrades, there are some that go a little further. Quite a few brands have modular bay designs so that users can swap between optical drives, additional hard drives or extra batteries, but some are going even further.

Some US-based makers of gaming laptops are now offering upgradeable ATI graphics chips thanks to a technology called FLEXIFIT that means all ATI graphics chips for notebooks are pin compatible. Also, upgrading your CPU to the highest supported by your chipset while possible, is not really feasible, due to the highly integrated nature of notebook design.

Desktop PCs, even small form factors, have modularity and upgradeability as a major asset. It allows for all the hardware to be replaced, which means a longer ride on the upgrade cycle than with notebooks. This traps a lot of notebooks in what we like to call 'console superiority mode'. Remember how both the PS2 and Xbox were supposed to kill the PC due to their amazing graphical abilities? This was true for a couple of months but soon enough the PC first leapfrogged then started to dwarf the consoles' abilities. Being stuck with an non-upgradeable notebook is a very similar thing.

There is also more potential for performance enhancement with a desktop system through tweaking and overclocking, which becomes a big issue inside the cramped, heat-sensitive confines of a notebook chassis. Inside a desktop PC you can tailor your cooling to allow you to squeeze as much as possible out of the system.

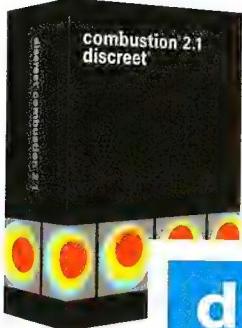
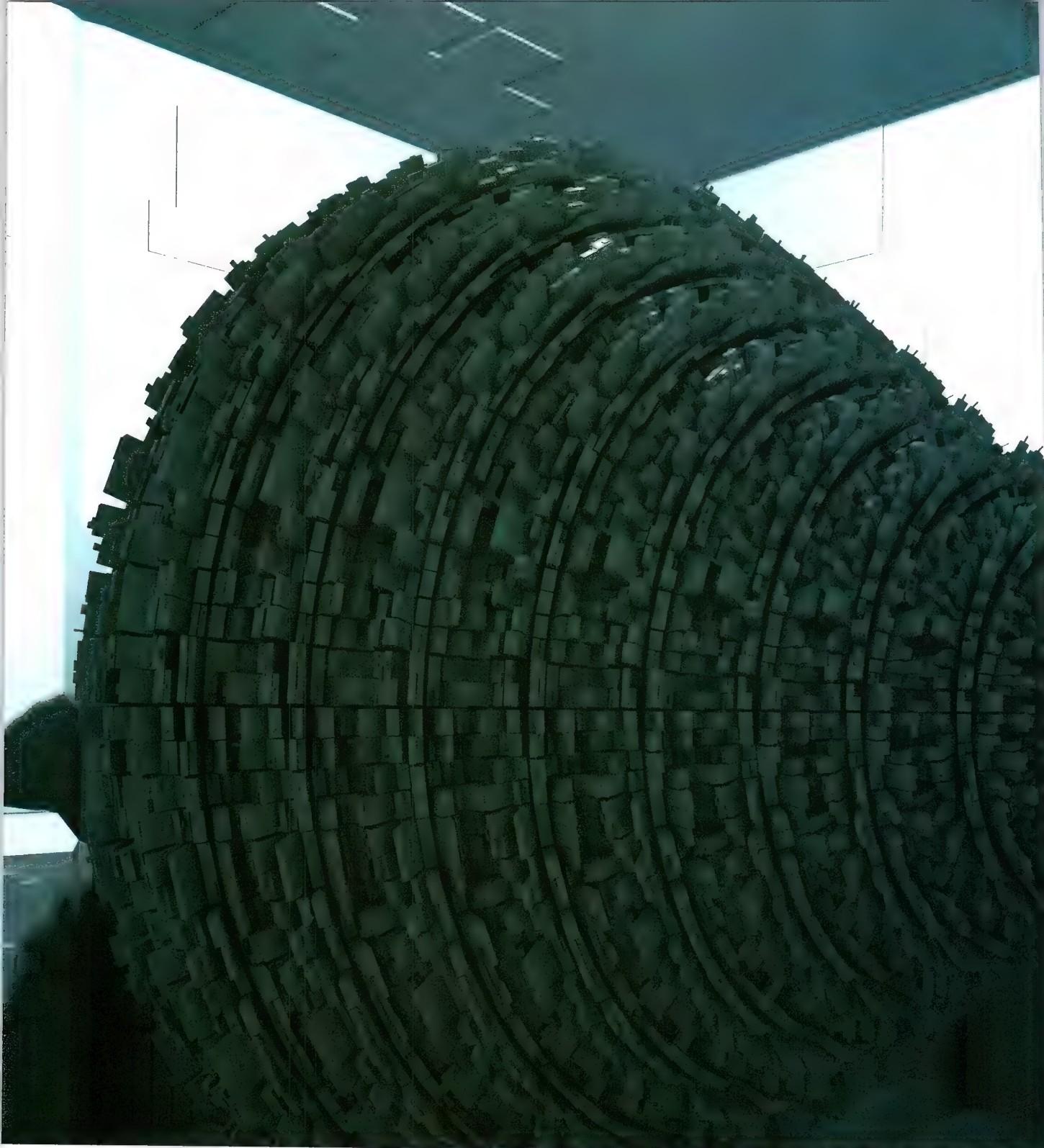
When it comes to wringing the most from our PCs, notebooks have a long way to go before they can be considered true replacements for the desktop. While technology is speeding ahead, it still usually lags six months behind advances on the desktop, which in silicon land is an entire third of a product cycle.

For people specifically looking for a portable computer, the increasing breadth of the market means you can now find a model that suits your needs without spending your life savings in the process. And that is a great thing indeed.

Retiring the CardBus

PCMCIA standards committee has voted to retire the CardBus standard. The new standard, ExpressCard, will be available in 2003.

ExpressCard, which is based upon PCI Express, This new technology allows not only for faster data transfer but also smaller form factors. Only 5mm thick, the standard ExpressCard is 10mm shorter and 20mm narrower than a PCMCIA CardBus card, while there is also a 54mm wide version for larger hardware like 1.8in hard drives. ExpressCard will primarily appear in portable devices like notebooks and PDAs, but the specification does not prohibit desktop use. It is first scheduled to appear as part of Intel's Alviso chipset late next year.



The image was created via multiple arrays in 3Ds max 5.1, then rendered using brazil with high global illumination settings. No post processing was needed. <http://idrl.crh-systems.com/nu>

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Reviews



Tech for tech's sake

John Gillooly attacks functionality with Occam's razor.

Iдиocy comes in many ways shapes and forms, but a very special kind of idiocy exists in the technology industry. I like to call it over-technification and it occurs with monotonous regularity. You know what I mean; perhaps the most shining example was the multimillion dollar CD copy protection schemes that could be defeated by a Texta or a timely press of the Shift key.

One of my favourite examples of this is Microsoft's Tablet PC concept. Tablet PCs are essentially notebooks with a pile of costly functionality that turns them into electronic replicas of paper notepads. Tablet PC has been implemented beautifully, its handwriting recognition is sublime and, paired with an active digitiser, the pen input method is natural and remarkably powerful.

But there is no compelling reason to choose the Tablet over a piece of paper. Having now sat in press conferences with both, I find that my old notepad is infinitely easier to manipulate, conserves space and info stays easily retrievable. And it wasn't several thousand dollars.

In fact, after sitting in press conferences and watching journos armed with Tablet PCs, I now realise that the main usage seems to be wirelessly connecting to the Net and surfing during dreary presentations.

These kinds of products usually stem from the marketing rather than the engineering side of tech companies, and while Tablet PC is now an established white elephant, some head slapping doozies have popped up recently. Perhaps the best I've seen was US telco Sprint announcing that it would offer streaming TV to mobile phones.

This technological breakthrough is not without its challenges, the initial offering is smooth streaming audio but the video will come down the pipe at two fps, which is apparently fine for newscasts but not exactly ideal for action-heavy shows. Streamed shows will also lag behind scheduled broadcasting for a

minute or two thanks to the time it takes for converting and compressing the stream.

Aint technology grand? Thanks to years of mobile phone development we can now watch TV when and where we want (as long as there's reception). Sure, there is a compromise of quality and a US\$10 a month fee, but that is a small price to pay for such innovation.

Or so you would think if you hadn't heard that Samsung is planning to include a TV-tuner in one of its new phone models. While you won't be able to get cable channels, this solution will be much faster than Sprint's streamed offering, limited only by the refresh rate of the phone hardware. It also means viewing is free, rather than a monthly fee to watch crappy quality TV.

It's impossible to think of any reason to prefer streamed video over free to air TV, after all, a phone is essentially a radio - if there is no reception, then you won't receive either of the signals.

Hmm, now do I want to go with the smoother, free TV-tuner way or jump onto a US\$10-monthly dose of sound-accompanied slide shows? I wonder. I wonder why Sprint is bothering. The mobile phone world needs a killer app, not technology for technology's sake.

I want new tech, I crave it. But with so much on offer it has to make sense and to differentiate itself from the rest. Streaming television at a quality that makes it nothing more than proof of concept is not enough to make me fork out cash. Adding a TV tuner for flexible, free TV on a mobile phone actually makes me take notice and consider it.

It makes you wonder at times just who green-lights such projects as Sprint's. It looks cool in isolation, but the weight of technology has got to the point that its uniqueness is all that's going for it. If only tech companies spent more time thinking and less time marketing, we might end up with solutions that do more than look cool on paper.





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After months of testing, re-testing and a little bit of tantrum throwing, the great *Atomic* benchmarking update is complete. Gone are the legacy benchmarks and in their place are a set of tests designed to cope with the next year's worth of hardware. Welcome to the *Atomic* Testbench 2004 Edition.

Aquamark 3

Based upon Massive Development's Krass engine, Aquamark 3 is *Atomic*'s new synthetic gaming benchmark of choice. It has a range of tests built into it, of which we predominantly use the standard test, which outputs an average framerate over the length of the test. We also use the Pixel Performance Test, which tests the number of pixels that the card can process, and is especially relevant when comparing graphics architectures.

www.massive.de

Call of Duty

Atomic has used Quake 3: Arena as a benchmark since we began, but unfortunately id Software's deathmatch is getting too long in the tooth for meaningful gaming results.

Call of Duty uses a heavily modified Quake 3 Engine and is a much more relevant gaming benchmark. We test using a custom multiplayer demo to ensure replicable results.

www.activision.com

Unreal Tournament 2003

We had originally planned to replace UT2003 with the new UT2004, however it has been delayed to early 2005. For now, we are continuing to use UT2003. The Unreal Warfare engine that powers UT2003 is widely used in games. We use prerecorded fly-by demos for our

benchmarking as the results from the botmatch demos vary from run to run and this inconsistency makes it impossible to arrive at a correct number.

www.epicgames.com

3DMark03

3DMark03 is under a cloud as a video card benchmark and is used sparingly for that purpose. We use 3DMark03 for its CPU test, which loads the CPU nicely with software shaders and provides a good indication of performance.

www.futuremark.com

3DMark2001SE Pro

This DirectX 8 era benchmark is still one of the best synthetic measurements of system performance. While we continue to use 3DMark2001SE Pro, we will always do it in conjunction with game benchmarks to provide a full performance picture.

www.futuremark.com

SYMark2002

While it is certainly the most temperamental benchmark that we run, SYMark2002 is an invaluable tool for comparing system performance. The current version is under dispute because of an alleged bias towards Intel CPUs, but the new SYMark2004 is due any day now and it should rectify these performance discrepancies.

www.bapco.com

Testbenches

Aquamark3

Standard Test

1,024 x 768; 32-bit colour; No FSAA; 4x anisotropic filtering; maximum details.

Pixel Performance Test

- 640 x 480 standard settings.

Call of Duty

Standard Test

- 1,280 x 1,204; Character textures – extra; General textures – extra; Trilinear filtering; 32-bit textures; World Dynamic Lighting Quality – nice; Model detail – maximum; Show Blood – yes; V-Sync – off.

Testbenches

Atomic has now updated our Athlon testbench to an Athlon 64 3200+ with ASUS K8V Deluxe motherboard.

We have also updated our hard drives to take advantage of Serial ATA, deciding on Western Digital's high speed Raptor model to minimise hard drive based bottlenecking of the testbench.

The rest of the testbench hardware is being finalised, but unfortunately confirmation of the precise products was delayed at the last minute. We will debut the rest of our new hardware next issue.

Both test systems use Windows XP Professional with Service Pack 1, DirectX 9.0b alongside the latest chipset and video card drivers.

- AMD Athlon 64 3200+ system – ASUS K8V Deluxe motherboard (supplied by ASUS: www.asus.com.au)
- Intel Pentium 4 2GHz – ABIT BD7II-RAID motherboard (supplied by ABIT: www.abit.com.tw)

Common components

- 36GB Western Digital 10,000rpm Raptor Serial ATA drives
- Supplied by Western Digital: www.westerndigital.com
- Corsair TwinX XMS3200 matched dual-channel DDR-RAM
- Supplied by Altech: www.altech.com.au
- Hercules Prophet II GTS 32MB
- Supplied by Guillemot: www.hercules.com
- 64MB Apacer memory keys
- Supplied by Anyware: www.anyware.com.au
- ASUS 52x CD-ROM
- Supplied by CASSA: www.cassa.com.au
- Belkin PCI FireWire card
- Supplied by Belkin: www.belkin.com.au
- Belkin PCI USB 2.0 card
- Supplied by Belkin

The *Atomic* HOT award is given only to the most kickarse products to hit the Labs. These are the products that receive a score from us of nine, or greater, out of a possible 10.



Framerate

The search for frame throwing booty gets interesting again as both NVIDIA and ATI's partners start unleashing the new generation of video hardware on a new generation of benchmarks.



SmartVGA 9800XT

SPECIFICATIONS: ATI RADEON 9800XT; 256MB 256-bit DDR RAM; 400MHz RAMDACs; TV-out.

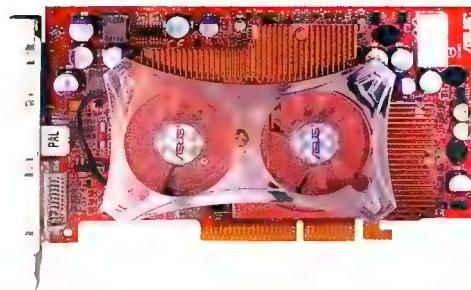
CORE SPEED: 412MHz **MEMORY SPEED:** 730MHz **PRICE:** \$855

SUPPLIER: SATO Technology www.satotech.com.au

This fella is the consistent reigning champ of the 9800XT world, even if it only beats the next two down by a margin of 1.8 percent. Seeing as all 9800XTs come out of the same factory from ATI, we didn't expect much of a difference between their performance except for the different BIOS versions. Not only sporting a flasher BIOS (beware pun), hence faster performance, but also this one is cheaper.



SATO Technology www.satotech.com.au



ASUS RADEON 9800XT

SPECIFICATIONS: ATI RADEON 9800XT; 256MB 256-bit DDR RAM; 400MHz RAMDACs; S-Video and composite in/out.

CORE SPEED: 412MHz **MEMORY SPEED:** 730MHz **PRICE:** \$969

SUPPLIER: ASUS www.asus.com.au

This is a decent card, but again more of the same 9800XT-wise. It does come with a Half-Life 2 voucher (for collection – download or postage – when it officially hits gold), but most 9800XTs are shipped with this. Performing identically to others, it does feature VIVO via a breakout box with four jacks for both S-Video and composite in and out. Good stuff aplenty with an ASUS price tag - this spells 'wallet emptying goodness'.



ASUS www.asus.com.au



Sapphire Atlantis RADEON 9800XT

SPECIFICATIONS: ATI RADEON 9800XT; 256MB 256-bit DDR RAM; 400MHz RAMDACs; TV-out.

CORE SPEED: 412MHz **MEMORY SPEED:** 730MHz **PRICE:** \$799

SUPPLIER: Achieva www.achieva.com.au

Pretty much indistinguishable from the first two in terms of memory speed, core clock and benchmark results, we've figured the only real deciding factor when choosing a 9800XT card is the price and what it comes equipped with. Like the majority of 9800XTs, this baby is packed with an imaginary full-version of Half-Life 2 (a voucher). It's another typically powerful RADEON 9800XT, but a little lighter on your bank.



Achieva www.achieva.com.au



Leadtek Winfast A380 Ultra

SPECIFICATIONS: NVIDIA GeForce FX5950; 128MB 256-bit DDR RAM; 400MHz RAMDACs; S-Video and composite in/out.

CORE SPEED: 475MHz **MEMORY SPEED:** 950MHz **PRICE:** \$745

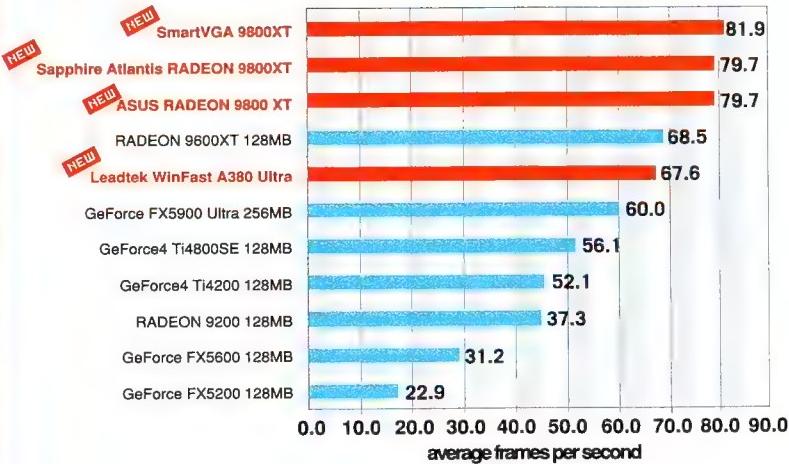
SUPPLIER: Rectron www.rectron.com.au

One of the reasons we chose CoD as a new test was to evade cheating drivers. Even with much faster memory and core speeds than the 9800XTs, testing shows NVIDIA are dropping off in real world tests. It shoots ahead in well-known benchmarks, but is this legitimate? With NVIDIA self-incriminating themselves by programming driver code to target aspects of a program, their cards will face the cheating question for some time.



Rectron www.rectron.com.au

COMPARISON: ATOMIC TESTBENCH



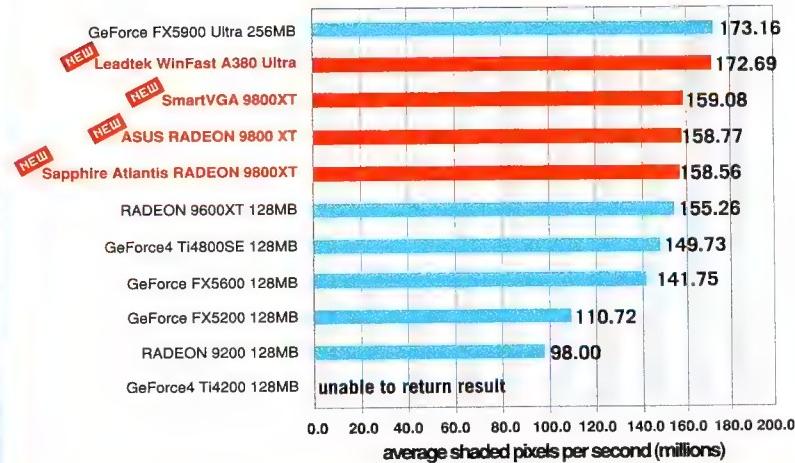
Video cards

The combination of a new round of graphics hardware and our new *Atomic* testbenches means that we have revamped our Framerate testing. Gone are 3DMark2001SE and Unreal Tournament 2003 and in their place comes Call of Duty and Aquamark 3.

For Call of Duty we have reported the average framerate in our timedemo as an indicator of in game performance.

As pixel shaders become more important for gaming, we have decided to run the Aquamark 3 Pixel Performance Test, which enables comparison of the shader units between different hardware. All the video tests are done using our Athlon XP 3200+ testbench, using 512MB of RAM. We tested this month with ATI's CATALYST 3.9 drivers and NVIDIA's ForceWare 52.16. All testing was done with DirectX 9.0b.

AQUAMARK 3



CPUs

It is now clear that the bout of CPU launches for 2003 ended with the Pentium 4 Extreme Edition and Athlon 64 launches during September.

Despite initial hopes Intel's Prescott core for the Pentium 4 would make it to market during 2003, it will now launch during the first few months of 2004. Prescott will probably be the last CPU core to bear the Pentium 4 name, with the Tejas core scheduled for late next year tipped to take on the Pentium 5 moniker. Tejas will also introduce a new 775 pin socket type called LGA, although we would not rule out the appearance of Prescott models based around the LGA-775 form factor before then.

AMD has a new 0.13 micron Athlon 64 core, codenamed Winchester, due in the first half of next year but nothing else until the second half of 2004.



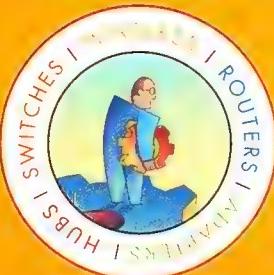
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Shuttle XPC ST61G4

ATI gives the integrated graphics world a kick in the arse, John Gillooly feels the vibrations.

Specifications:

RADEON 9100 IGP with DirectX 8.1 graphics; one 5.25in and one 3.25in drive bays; integrated card reader; Serial ATA; TV-out.



In what is becoming a slightly irksome trend for the Canadian chip maker, ATI first announced its RADEON 9100 IGP midway through this year but it has taken until now for actual products to appear. At last the trickle of products has begun, and over the next few months you are set to hear a lot about this chipset as most major manufacturers jump onboard.

ATI has done some minor league flirting with the core logic market in the past but it is with the DirectX 8.0 based RADEON 9100 IGP that it's getting serious. Over the past year we have seen how successful NVIDIA has been

with the nForce2 chipset, which redefined the concept of integrated graphics and dominated the Socket A market with unbeatable performance across the board.

While there will be platforms for AMD's CPUs appearing down the track, from ATI the initial offering is for the Pentium 4; in direct competition with Intel's 865G chipset. Intel's Extreme Graphics 2 is a perfectly competent solution for hardcore cooperative Excel workbook action, or high resolution PowerPoint display. However, for gaming, plugging your monitor into a dead fish would be about as effective.

ATI's integrated graphics (IGP) offering is much more advanced – essentially a trimmed down RADEON 8500 chipset. This delivers not only acceptable framerates but also all the other advantages for digital media that ATI's technology brings, including some novelties like the ability to use the IGP as a RAMDAC in conjunction with a RADEON AGP card for triple monitor support.

Besides the graphics, the RADEON 9100 IGP also supports the latest 800MHz FSB Pentium 4 CPUs and dual channel DDR memory. Its Southbridge has basic functionality like ATA133, AC'97 and USB 2 support, but lacks the advanced features like RAID and native Serial ATA that are present in Intel's ICH5-R Southbridge.

As mentioned before, this chipset was due to launch midway through this year and we have been eagerly chasing products since then. We have had a few promises of motherboards that fell through due to problems with the chipset, but when these issues were finally nailed it was Shuttle with its sexy looking XPC ST61G4 that took the honours of being the first into the *Atomic* Labs with this chipset.

Based upon the same generation 4 chassis as the Athlon 64-based SN85G4, the ST61G4 comes with a brushed aluminium

finish and snazzy reflective front panel with integrated card reader. Internally it is more similar to the common G2 series XPCs, staying away from the inelegant and fiddly separate 3.25in drive bay used in the SN85G4. The layout is generally good, although the actively cooled Northbridge heatsink means you need to take care to tuck the IDE cable into its retention clip so it doesn't block the chipset fan.

Everything was super until we tried to run the unit and had a nasty little problem. Initially benchmarks would crash midway through testing and then the XPC started spontaneously rebooting. Three BIOSs, Olympic-class tweaking and countless emails later the problem was narrowed down to something endemic in the RADEON 9100 IGP – memory sensitivity.

While ATI has delivered a great chipset, it is incredibly sensitive to the brand of RAM being used. We tried several types here in the Labs, including older Corsair and KingMAX DDR400, however these problems persisted. Luckily, after hearing the problems were not just confined to Shuttle's product we tracked down some ADATA DDR500 and sure enough the system began to run like a dream. ATI does have a list of validated memory types up online (even though the ADATA is not there), so make sure you look at www.ati.com/products/radeon9100igp/memvendor.html to make sure your RAM will like the chipset.

We benchmarked the XPC ST61G4 against an i865G platform until it became painful. The kind of painful that only comes from watching a five-minute Call of Duty time demo take two hours to run – at 800 x 600 with maximum detail settings, laying down a whopping 0.8 frames per second. Such was the performance of the i865G in games. On the other hand the RADEON 9100 IGP was not showing cutting edge performance when compared with discreet graphics, but it was a damn sight better than the i865G.

In the shader heavy Aquamark, the 9100 IGP scored double that of the i865G, achieving decent framerates even if they may not have been playable. If you want great gaming graphics, then no integrated solution is really that suitable anyway, but there is nothing available for Pentium 4 that can even come close to the RADEON 9100 IGP. All it takes is some down-tuning of graphics settings and the games are playable, even if they are only a light-mapped shadow of their former shiny and sparkly selves.

Even though ATI's graphics are great, Intel's chipset range is much more balanced for general use, with some fantastic functions packed into the Southbridge dwarfing the basics of ATI's offering. That is the big difference between the RADEON 9100 IGP and nForce2; NVIDIA managed to not only deliver good integrated graphics performance, it did it alongside a set of industry leading features. ATI does the Northbridge beautifully, but the Southbridge is lacking that special something.

While the ST61G4 is beautiful both in looks and performance, we just feel that, for this niche, it isn't as robust a solution as an i865G based unit (despite its extremely arsey graphics). ATI has a good enough chipset, but like NVIDIA's first nForce, we suspect it may not be until the next generation that it becomes really revolutionary.

According to Chinese medicine, there's about 900 acupuncture points on the human body.



JG

Albatron FX 5700U & Sapphire RADEON 9600XT

John Gillooly gets stuck in the middle of the market and he couldn't be happier.

Albatron FX5700U

Specifications:

GeForce FX 5700 Ultra; 475MHz core; 128MB 900MHz DDR-2 on a 128-bit bus; triple fan heatsink; extra power required.

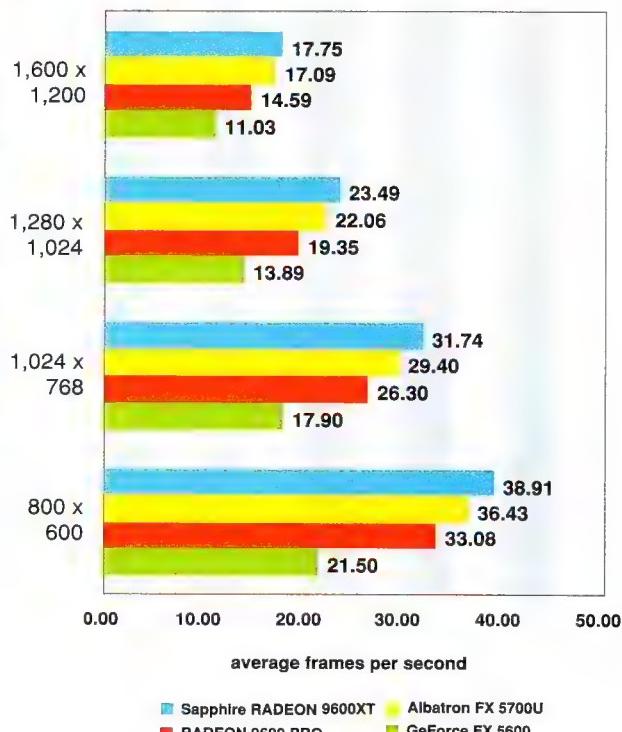


While ATI is dominating the performance dogfight in the high end of the graphics market, the battle is heating up in the more profitable mid range. ATI has had a small but comfortable lead with its RADEON 9600 PRO, slipping in a little faster than NVIDIA's GeForce FX 5600.

While both NVIDIA and ATI announced new mid-range cards almost two months ago, it has taken a while for them to filter through to the market – longer than the month or so lag time that has become commonplace. The reason for this is an interesting one. The NV3x and R3xx generation of cards were made at a central location and then passed on to card manufacturers for rebranding and fancy heatsinking. This still happens at the high end, with cards appearing from the factories of PC Partner (ATI) and Flextronics (NVIDIA). However the mid range cards are now being made by the card manufacturers themselves, so delays have come from design and manufacturing, instead of just chip delivery schedules.

Changing back to a multitude of manufacturers is a great thing. It allows for weird tangential design changes (like the raft of heavily modified GeForce4 Ti4200 cards that appeared last year) and pumping up of specs. It means differences between products that go further than the colour of the sticker on the heatsink. And now that variety is returning to the market makers will start focusing more on getting maximum performance from their cards.

Aquamark 3 - average framerate



■ Sapphire RADEON 9600XT ■ Albatron FX 5700U
■ RADEON 9600 PRO ■ GeForce FX 5600

ATI's RADEON 9600XT is the Canadian giant's salvo in this battle. It is the second generation of ATI's 0.13 micron chip, differing through the use of new Low-K Dielectric material called 'Black Diamond'. Architecturally it is identical to the other RADEON 9600 series chips, but the Low-K material allows for higher clock speeds to be reached, and hence higher performance. The chip now includes a thermocouple as well, which ties in with ATI's OVERDRIVE overclocking utility to allow for automatic speed boosting.

NVIDIA has made more changes with the GeForce FX 5700 Ultra. This is the first chip to come out of IBM's state of the art fabrication plant in East Fishkill, New York, and is based upon a 0.13 micron process (NVIDIA has been happily crowing that IBM are so good the first silicon will go into production). We suspected that the FX 5700 Ultra was to be the first Low-K GPU from NVIDIA, but subsequent reports from Digitimes indicated that this was not the case as IBM had been experiencing problems with the SiLK Low-K Dielectric they use.

Architecturally NVIDIA has done a couple of things to the GeForce FX 5600 core to improve it. These changes were essentially the same as those done to drag the GeForce FX 5800 Ultra's sucky performance up to vaguely respectable with the GeForce FX 5900 Ultra. This has involved swapping the integer pixel shaders for floating point units, antialiasing tweaks and the addition of NVIDIA's Ultrashadow technology for improving shadow buffer performance. Finally NVIDIA has paired the GPU with DDR2 memory, which was pre-emptively used to poor effect on the GeForce FX 5800 Ultra.

We have looked at examples of both of these cards. From Sapphire we have a RADEON 9600XT and from Albatron we have a

Sapphire RADEON 9600XT

Specifications:

RADEON 9600XT; 300MHz core; 128MB 600MHz DDR on a 128-bit bus; on-die thermocouple.

Supplier:

Achieva
www.achieva.com.au

Website:

Sapphire
www.sapphiretech.com

Phone:

Achieva
(02) 9742 3288

Price:

\$299



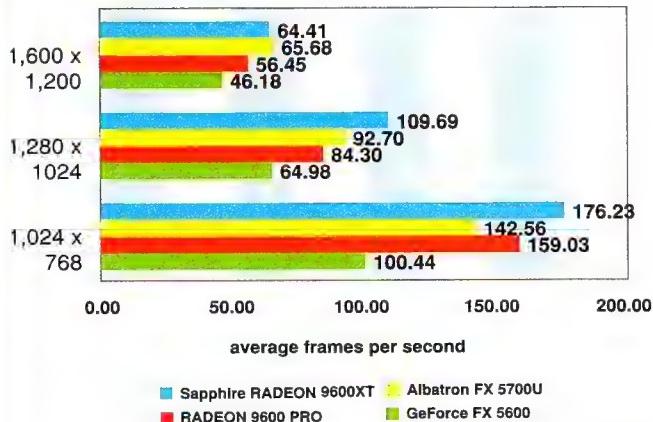
GeForce FX 5700 Ultra. Sapphire's 9600XT card looks a lot like the previous generation cards, largely because Sapphire is the retail arm of ATI's super manufacturer PC Partner. It has two main physical advantages over the GeForce FX 5700 Ultra, it doesn't need additional power and it comes with Half-Life 2. Or at least it comes with a voucher redeemable for Half-Life 2 once it actually ends up being released. These vouchers deserve special mention, as once you scratch away the silver bit covering your registration code you cannot return the video card (the fact you can read the code through the protective silver without scratching it is a little worrying though).

Albatron's FX5700U is a big chunky card, light years from the cut down simplicity of the Sapphire. It uses a full size PCB, looking remarkably like a GeForce FX 5800 Ultra without a copper-based destroyer of worlds strapped to it. Instead it uses Albatron's Wise Fan II cooling solution. Of the three fans mounted on the heatsink, only two spin under normal circumstances, the third kicks in if one of the others fails or if the card starts getting to the ultra toasty stage. The cooler covers not only the GPU but also the heat pumping DDR-2 Micro BGA memory chips, and the card has a Molex connection for external powering.

Testing

We tested these cards using our Athlon 64 testbench, and for comparison we have included results for the RADEON 9600 PRO and GeForce FX 5600 (unfortunately we did not have a GeForce FX 5600 Ultra on hand). The RADEON cards have been tested with version 3.9 CATALYST drivers and the NVIDIA cards use Forceware 52.16 drivers.

UT2K3 - high quality



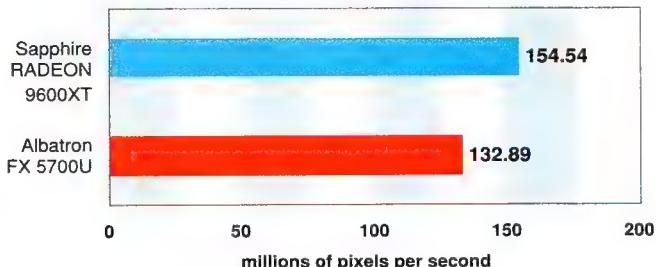
In the standard Aquamark 3 tests the RADEON 9600XT won at all resolutions, although it was only beating the 5700 Ultra by the slimmest of margins. Both cards were a touch faster than the 9600 PRO and smacked the crippled 5600 around the Labs. This is testimony to the improvements that NVIDIA has made to the core, and these results show that NVIDIA is now a strong contender for the mid-range dollar.

We have also included the results for Aquamark 3's pixel shader performance test. ATI's main advantage with the current generation of hardware has been superior shader performance, so this is a number of great importance. It shows the RADEON 9600XT still having a 15 percent speed advantage in pixel shader operations,

and this is still the one chink in the FX 5700's armour when running DirectX 9.0 games.

Unreal Tournament 2003 showed a more mixed picture. It has always been less stressful on NVIDIA's cards than other benchmarks, thanks to the sparing use of pixel shaders, but the results showed where the advantage of DDR 2 came in. While both cards delivered eminently playable framerates at 1,024 x 768 and 1,280 x 1,024, the RADEON 9600XT won those tests by a decent margin. However at 1,600 x 1,200 both cards were pushing the memory bandwidth boundaries, and seeing as both cards had 128-bit memory busses, DDR-2 gave the 5700 Ultra a little advantage and helped it to just scrape past the 9600XT in the performance race.

Aquamark 3 - pixel performance



There is little to separate these two cards, which delivered pretty astonishing performance for the price. Both have full DirectX 9.0 support, although ATI's shaders are widely acknowledged as being the better offering, something backed up by the shader benchmark numbers.

Assuming Half-Life 2 is actually released sometime during this generation of graphics cards, the hundred dollars of brand new alien killing science simulator is a clincher that would normally make buying a RADEON 9600XT a no-brainer. However, Half-Life 2 is in a release date void, with no official announcements forthcoming (the best guesstimate we can make, based purely on the rumours we are hearing, is March/April 2004 – but just look at Team Fortress 2 for Valve's track record).

Given the up-in-the-air status of Half-Life 2, the decision is much harder. Both cards delivered great performance for a very similar amount of cash output. The 5700 Ultra snuck ahead when the memory bandwidth was stressed, and the RADEON 9600XT did it when pixel shaders were used. Either card is great value for money, and these cards should spark a big revival in this segment of the market, much like the Ti4200 did a year ago.





Creative Prodikeys DM

Logan Booker checks out the keyboard that does it all.

Specifications:

37-key MIDI-compatible keyboard; standard PS/2 keyboard; Prodikeys music software; record WAVs, MIDIs and MP3s.



Supplier:

Creative
asia.creative.com

Website:

Creative
asia.creative.com

Phone:

Creative
(02) 9021 9800

Price:

\$199

Carbon dating places the age of the Turin shroud somewhere around the 14th century, making it highly impossible that it was used to wrap Jesus Christ.

You haven't seen Prodikeys in action until you've experienced it in use by its enthusiastic creator, Paul Seow, perhaps one of the funkiest guys Creative has in its arsenal of personnel. Suffice to say, after watching him demo it for us, we couldn't wait to get our hands on one.

The Prodikeys unit is a combination of a standard PS/2 keyboard and a 37-key MIDI keyboard – with the addition of a few shortcut buttons, including one that automatically loads the bundled software. Not in itself a feat of engineering prowess, but this isn't all you're paying for.

At its heart, Prodikeys is an intelligent music creation program, aimed at both the novice and the professional. In reality, it caters a lot more for the former audience, and while not necessarily bad, this does lower its value somewhat.

It's easy to get started – just hook the unit up to your computer [replacing whatever you already have in terms of a keyboard], install the software and start jamming. What you'll quickly learn is that unless you have some sort of musical finesse, you're not going to get much out of Prodikeys.

The initial fun comes from using the hit-and-play PentaTunes and FunTunes. These allow anybody to create something recognisable as music, despite the fact that you're not really doing much at all. PentaTunes provides a bunch of pre-generated chords, effects and sounds that you can play around with, while FunTunes gives you a selection of instruments to play, their melodies pre-defined. The only control you really have with these modes is the type of music (Jazz, Ballad, etc) and the sequence in which you bash the keys – the end sound is almost always the same.

IntelligentChord, FixedChord and Perform mode are available for the serious muso, despite the fact that they're not that configurable. Each mode (especially Perform) presents the user with a bunch of keyboard-like buttons on-screen, which you can use to configure chords – in the first two modes – and melody types, pacing and instruments in Perform mode. The visuals are provided so users can match each command to their appropriate keyboard-based shortcut. IntelligentChord and FixedChord are not for the faint of heart – you should have a solid musical grounding to make the most of (or even just to use) these modes.

The last mode, and perhaps the least appealing after you

realise its long-term effects, is Learn mode. Designed to teach the musically-challenged how to play the keyboard, the mode suffers from a flaw that has to do with the 37-key unit. Obviously, 37 keys don't cover the full range of a piano (88 keys is standard), and require the user to shift up and down octaves using either the mouse or the left/right arrow keys.

This is a disastrous situation for the fledgling musician as it's going to completely throw out your ability to play a full-sized piano on which middle C is a foreboding piece of non-moving ivory.

The Learn mode also encourages the user to look at graphical representations of the keys they should hit, rather than the provided sheet music.

Other noteworthy features of the software included its ability to import a MIDI and turn it into sheet music, and to record what you play as a WAV, MIDI or MP3.

Being able to save in MIDI format is great, as you can load the file back into the Prodikeys software and have the sheet music right there, instead of having to write it out – a time consuming activity you'd normally do when composing.

As a normal keyboard, Prodikeys is uncomfortable. A slide-on cover, which goes over the MIDI keys, emulates a wrist-rest; but it's hard, rough feel isn't welcome while typing and by reflex you'll arch your hands slightly to avoid it.

This places strain on the arms and shoulders and you'll quickly be swapping Prodikeys for your normal keyboard for serious typing. Functionally though, the keyboard is fine and includes a couple of programmable buttons. There's also a volume control and a pitch bender, so you can warble your notes like the best.

Creative's Prodikeys DM requires dedication and a good musical mind. Unfortunately the hardcore musician will want a professional setup, and the novice will be baffled by the variety of modes that, on the surface, don't seem to do much. The combined functionality and features make it appealing at \$199, but in the end, it just felt a little gimmicky, and the novelty will wear off quickly.



ABOVE: IntelligentChord mode.



ABOVE: PentaTunes mode.



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Creative Audigy 2 NX

Specifications:

102dB SNR ratio;
24-bit/96kHz DAC;
S/PDIF support;
USB 2.0.



It's rare to see a notebook with decent audio capabilities. Beefy sound means more power and heat output for little gain, as most laptop users are business folk who have little use for the high-quality 5.1 capabilities of superior audio chips.

That said, like all markets, there's a niche to be served. For the Audigy 2 NX, that niche is the mobile users after a proper aural experience.

While the NX worked fine with your normal desktop PC, this little sound-card-in-a-box would see most use next to your laptop.

The capabilities of the NX were

Supplier:

Creative
asia.creative.com

Website:

Creative
asia.creative.com

Phone:

Creative
(02) 9021 9800

Price:

\$299

similar to other Audigy 2 cards. It supported all the Dolby and DTS functions of the Audigy 2 range, along with EAX, SoundFonts and CMSS. Around the edges of the unit were various connectors for audio in and out, with the 'front' sporting an IR receiver for the included remote. On top were some buttons and lights for power, mute and CMSS. The gadget interfaced with the PC via USB.

Surprisingly, the NX was not powered by the port, instead it relied on an external two-piece adaptor. This made the NX just that little less portable. So, while the unit was small, the extra gear you'd be carting around negated the advantage of its size. One would also assume you'd be lugging a speaker (and subwoofer) as well, as the whole point of the NX was outputting audio from your laptop to a decent set of speakers.

Of course, none of this would be a problem if you're using the NX with your PC, and if this was the target audience, there wouldn't be a problem. This wasn't the fault so much of the product, but with everything it needed to work fully.

As with all of Creative's sound products, the quality of the sound couldn't be faulted, with the NX producing crisp audio no matter what we threw at it. Our only concern was how exactly the target market would respond when they considered what's involved in making full use of the Audigy 2 NX.

LB



JAZZ J8989 1.1 sound system

Specifications:

8W three-speaker satellite; 20W subwoofer; 'Point Source Audio' technology; connects to consoles.



Last month we checked out Creative's excellent T7700 7.1 speaker set. You might remember in that review we talked about the future of surround sound, and said that it lay in the mounting of a combined speaker helmet to one's head. If the T7700 brought us one step closer to that destiny, then JAZZ's J8989 pushed us headlong in front of it.

This '1.1' speaker set emulated a normal 2.1 setup using 'Point Source Audio' technology. Basically, three drivers were mounted in the one stand; the two 'side' speakers placed a little behind and on an angle

to the central speaker. As the sound travelled out from the side speakers, while being blocked by the front speaker, you ended up with an interesting audio dynamic, one that had you turning your head from side to side as your brain tried to orientate itself.

The advantage to this setup was that it cut down on cables, and allowed you to have '2.1' sound in a place you normally could not.

The single, 8W satellite also came with a 20W subwoofer, which had a single hook-up for the 1.1 stand. The sub had an unprotected speaker on its underside, one you'd easily put your finger through if you weren't aware of it.

We played a variety of tunes through the setup, and tested it on both a laptop (with crappy sound) and an Audigy 2. While the speaker benefited from the higher-quality sound card, it was still slightly tinny. The sub was a bit of a letdown; only on its highest setting did it produce a satisfactory effect. Despite this, the sound was sufficiently clear and deep, especially considering the price.

It's no replacement for a dedicated 2.1 or 5.1 setup (and you'd best save up if that's what you're after), but the JAZZ J8989 did win out by being just plain funky, if a little underpowered.

LB



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Archos AV300 series MP4 Jukebox


Specifications:

20GB/40GB external
USB 2.0 HDD; 3.8in
320 x 240 LCD
(QVGA) display; MP4
video player (DivX
and XviD 4.0 & 5.0);
MP3 player; image
viewer; composite
in/out; S-Video; IR
remote control;
headphones; inbuilt
microphone.



Beautifully crafted, this device is a great example of the union of appliances. It's an external hard drive packed with features and a colour 3.8in LCD screen. This reeked of potential.

Running off the battery, it's rated to provide 3.5 hours worth of video time and 10 hours of audio. After much exploring, we watched *Jimmy Neutron* and promptly bombed out half way through some 007 (a low battery warning would've been nice). When you considered it's not only pumping out both sound and video, but also juicing a hard drive, this was passable. Keep the power adaptor handy, the battery is inbuilt.

The display was good quality – great colour with no signs of blurring, but we had a problem with it being a tad on the dark side. Equipped with a microphone, recording quality was among the best we've heard – crisp and clean. The supplied headphones were also fairly good, but to clean your ear sockets out you'll want something a little more extreme.

You can set the device to use either the inbuilt 3.8in colour LCD or output to a TV for video and audio. In fact, this could both capture and output both video and audio to any device that's equipped with composite or S-Video jacks. It also came with an IR remote, so it'll be at your command at all times. An array of add-ons can be purchased, such as a 3.3 megapixel digital camera, video recorder and FM radio, so you're not left dry for options.

Speaking of options, there are scads of them – with power, sound and video adjustments – tweaker's ecstasy. Though it's limited to a maximum resolution of 640 x 480 and only supports MPEG4 video (both DivX and XviD) – to make things a little easier, but not very time friendly, a copy of Virtual Dub and a custom converting program were included to reduce resolutions.

It's expensive but almost worth every cent. Apart from a few small quirks, a lot of effort has gone into development. This is what a portable media device is meant to be. Hot damn.

ND



Lite-On External DVD+R/RW SDW-200DX

Specifications:

2x DVD+R/RW; 1x
DVD-R/RW; 5x DVD-
ROM; 16x/8x/24x
CD-RW; 8MB cache.



It seems that barely a month goes by without a new optical drive being unleashed from the renowned Lite-On factories. Most look rather ordinary, with beige being the standard colour, but they always seem to more than make up for it with their incredible performance, hardware boosting firmware updates and extremely affordable prices.

This external DVD writer looked pretty neat, in fact, it's probably the best looking optical drive Lite-On have ever released. It's slim, sexy, and blue – making it look feisty, being USB2.0 and all.

We found feisty was not the case performance-wise, however. Rated at 1x DVD-R and 2x DVD+R, this didn't break any speed barriers; just negative sound barriers because it's extremely quiet.

Whacking in a Verbatim 4x DVD-R, writing the *Atomic DVDzilla* (as per last month – 4478MB of two highly compressed zip files) in Nero, after downing 11 coffees and losing all sense of time, it finally completed a disc. In a painful 59mins and 34secs. Yek!

As its DVD+R speed was rated at twice the speed of DVD-R, in went a Ricoh 4x DVD+R (with no Verbatim DVD+ available). It burnt an entire disc in the slightly-faster-yet-still-damn-slow time of 29mins and 9secs. These speeds were about right, but why must it be rated at such low speeds?

It's slow. Agonisingly slow, but it's half-neat for the purpose it was built for – a highly portable external DVD writer. Not a top performer, but extremely transportable. But what really let our love anchors loose was the stupidly, insane, skyrocketed price. For this amount, you could purchase a high performing DVD± writer, an external carry case and a year's supply of coffee beans. This is aimed at those with truly elite wallets who are happy to sever all ties with performance in favour of style and mobility.

ND



Nokia N-Gage

John Gillooly gets acquainted with Nokia's game flavoured taco.

Specifications:

Triband GSM phone; MP3 player; digital radio; gaming platform; Bluetooth; GPRS.



Supplier:

Nokia
www.nokia.com.au

Website:

N-Gage
www.n-gage.com

Phone:

Nokia
(02) 9429 9000

Price:

\$600 without a phone plan

It was a quiet day at the athletics field until I saw the small child wandering lost towards the javelin competition. No-one else had noticed so I ran, not thinking, on an intercept course to save the poor kiddie. Hence I didn't realise I had stumbled through the discus throw until one of those small heavy frisbees embedded in the side of my skull. At least that is the story I tell when people ask why I am talking into a semi-circular protrusion on the side of my head. It's less embarrassing than explaining the more prattish side of the design of Nokia's N-Gage gaming phone.

After an almost interminably long hype phase N-Gage finally launched in October and we have been putting one through its paces for a while now. It is a serious corporate change for Nokia, as it is the first stage of an attempt to own the mobile phone gaming market. While the phone is destined to be compared to Nintendo's Gameboy, it's a different beast entirely.

It is better to approach N-Gage as a convergence device rather than as a pure gaming platform. It packs in nearly all the features seen in high end mobile phones, and more, but does so for a fraction of the price that other phones do (including other Nokia models). But unfortunately, in the pursuit of gaming, Nokia has made some compromises to the use of the N-Gage as a phone.

For a company so focused on handset design and usability, Nokia has made some strange departures with N-Gage. By far the most annoying feature is having to talk into the side of the phone, but there are other annoyances, like being forced to use your right hand only for SMS thanks to the wide phone body. As a gaming device the design is generally good and comfortable, but it gets confusing when a game requires more than the normal two raised action buttons on the phone.

Games for N-Gage come on Multimedia cards (MMC) that mount in the back of the phone. Adding a game involves removing the back panel and battery of the N-Gage, which can quickly become a freakish juggling act when you try to change games when travelling.

The inclusion of only one MMC slot also means that you

After 150 years of drifting, a message carved in wood by a Japanese seaman washed up at the village where he was born. It told the story of him and his stranded shipmates (they all died of starvation).

cannot have a card with MP3s and a game loaded at the same time. An infinitely better solution can be found on the Tapwave Zodiac gaming PDA, which has two SD card slots that are externally accessible.

As far as quality goes, the games on N-Gage are light years ahead of what is commonly available but they're a mixed bag. While the 3D flagship Tomb Raider looks great, the narrow screen aspect and low polygon count detract significantly from the game. Especially disturbing in the graphics department are the two pyramids that seem to have been built by a tiny civilization living on Lara's chest. Forget shooting endangered tigers, all this polygon-starved Lara would need to do would be give them a hug and they'd be blinded forever.

Nokia has proudly mentioned a few times now that this is the first multiplayer version of Tomb Raider on any platform. Which would be just super if it was more than just the ability to download other people's ghosts and try to beat their time through a level. It works well with the medium, but is hardly the most thrilling way to multiplay.

We unfortunately couldn't get the granddaddy of cross platform titles, Tony Hawk's Pro Skater, in for testing. It has looked like the best of the 3D titles in the leadup to launch, however it does suffer from confusing button layout. Instead we tried some platform titles, Sonic N and Pandemonium.

Pandemonium is surprisingly good, and works well with the aspect ratio of the N-Gage screen. Sonic gets around the limitations by using blue bars at the top and bottom of screen to give a gameplay area close to a normal television screen shape, which is highly important in a fast moving platform game.

Other functions on N-Gage are fantastic, packing in MP3 playing, Bluetooth, Digital Radio, a personal organiser and digital media playback. It is here that the real value of N-Gage lies. Sure you can game better than other phone users, but you would search for a long time to get these functions in a single unit for such a low price.

While you will feel like a bit of a tool when it rings, N-Gage does deliver some amazing features, and the games are a rung above what is out there at the moment. We may have to wait a few generations for the promise of truly kickarse mobile phone gaming, but N-Gage is certainly a competent, if somewhat flawed beginning.



Sonic is our pick of the titles we have tried. It is fast, fun and satisfying.



SCORE

7.5 / 10

JG

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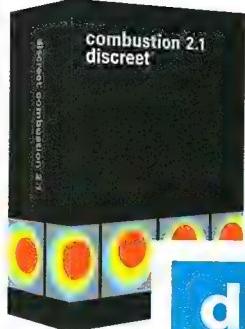
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designed by: **Wasabi** image design doug@wasabiklan.com



The figure is a Poser figure made by Sixus1, it was posed in Poser (surprise!) and exported to Cinema4D for texturing, lighting and rendering. Goes to show Poser isn't all about 1/2 naked babes in temples :)

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The call of the tame

What's with the hyped up masses of clones?
Nathan Davis wants ninja truffles:

It seems ingenuity has been leeched right out of most game developers – like a watermelon filled with Vodka and left to sit to the point of self absorption. Where are the fruit smashing, mind shagging titles we frequently hear of? There's all this hype surrounding S.T.A.L.K.E.R., Half-Life 2, Far-Cry, Doom 3, and need I mention Duke-bloody-Nukem Forever? Their common factor is they're all First Person Shooters – making them mostly same ol', same ol'. The industry is missing the cliché used oh-so-often you ignore it; ground breaking games. See? You just skipped over it.

Perhaps to the surprise of many, I've only just begun to properly play Counter-Strike (shock-horror). Quite a lot actually, and I've grown to appreciate the game (version 1.5 baby – Steam is a half-arsed chipmunk buttock) enough to make for a satisfactory gaming session. I now realise what it is that draws so many people in. Not just that it can run on your parent's 486, but the game itself is simple in nature, yet involving. Buy your favourite tools (B+4+3+B+1+3+B+B+2+B+B+8+3+B+8+4+,+.,+.), tactically find the enemy and shoot. Brilliance.

It certainly wasn't the graphics that made it so popular, yet this is one of the early ground breakers. In its young days, it became the biggest hit because it brought the best gameplay of all multiplayer titles into the one fast-paced, realistic, tactical and objective driven shooter that managed to have people sitting on the edge of their seats.

With Counter-Strike's popularity came floods of games attempting to capture the same magic, only in a prettier form. Which, for the most part turned out fairly neat, but with today's inspiration to make games look better, it seems one very important thing has been tossed into the backseat; in order for a game to be a game, it should be fresh, fun and have content, with the

emphasis on fresh. Generally speaking, many have the fun and content; it's just usually a case of 'been there done that'. Where are the garden-fresh juicy fruits?

I don't have a problem with most genre clones featuring trippy graphics and other enhancements, but I do take issue with the fact that genre stomping games are seemingly impossible to find. Today's games are like slightly different coloured chessboards with differently shaped pieces. Hey, I love chess, but, unless you're a collector of all things chess, one board will do just fine.

The problem is that games are missing the love – a primary reason why CS has become as popular as it is today. It was nurtured and developed in a garage out of pure dedication and love for the game – a true example of 'by gamers for gamers' – as compared to the current seemingly manufactured state of many games. How about creating something never before seen? A leap into the wild. Have developers reached the limit of their imagination?

If two or more years are spent on a game, how about producing something really new? A game that will go down in the history books. Perhaps, dare I say, not a shooter. Every 1½ games is a FPS. How about a Computer-Boy game – 'I know wet towel' or an *Iron Chef* title – 'Hooah, truffles'. OK, that'd be scary but you get the gist. For me there is one exception – my dream holy grail of all FPS games is a stick-figure martial arts FPS. What could possibly match sticks beating the crap out of each other? In case you haven't joined in on the stick figure fighting cult, this site should help educate (not for the squeamish): www.stickpage.com.

The bean counters are against great new games that dare to venture into fresh territory – it's all about the big fat cheque. It's a stinking conspiracy. Developers, think of the children. Well that's my month of gaming monkeyshines. Until next time, be merry and switch prezies – toodles.



the engine room

The Engine Room

Keeping it Unreal

Tim Sweeney, Unreal's uber 3D guru, and the 'other' Carmack, talks to James Wang.

For the longest time, id Software and Epic were the only two heavyweights in first person shooters. Ever since the release of Unreal Tournament 2003, Tim Sweeney, the brains behind the Unreal engine at Epic, has been maintaining a low profile while hard at work on the developer's next generation engine. Luckily we had a chance to speak to him recently and gather his thoughts on Unreal, the present state of FPS and the future that awaits us.

C The Unreal engine has to be one of the most successful licence engines out there. It has probably more licensees than the Quake engine – what's the key to this success?

TS Well, two things. First of all are the tools. It has the best set of content developer focused tools. We're a small company. When we were doing UT2003, we were only 20 people and now we're 25. Being small, it's really essential that we have great tools so that our level designers can build really large and detailed levels without requiring a massive amount of manpower. So we put a lot of effort into just getting the tools right and making them very productive. The other thing is, we put a lot of effort into going around and supporting our licensees and having family relations there, which is something id Software hasn't really done. They've mostly been – if you licence an engine, they send you a CD with the code and not a whole lot of directions with them.

C What is the current state of the Unreal engine? After the last round of work which really boosted the polygon output, what's its current status? Has it been constantly updated?

TS The first generation of the Unreal engine came out in 1998 and that was focused on software rendering. What was released first with America's army and then Unreal Tournament 2003 is the second generation Unreal engine and is focused on DirectX 7.0/8.0 hardware and beyond. We're really

taking advantage of really high poly count scenes, hardware lighting and transformation and later pixel and vertex shaders. Now we're coming out with UT2004, the next major step in the Unreal franchise. It's not a completely new engine; it's a bunch of incremental improvements onto the top of the existing ones. If you remember back to 1998 when, starting with the Unreal 1, we got Unreal Tournament in 18 months. That's really our strategy with UT2004 – to incrementally improve it and to focus on the gameplay more than adding new tech. So what you're seeing with UT2004 is really the culmination of the second generation Unreal engine.

C With this evolution constantly continuing, do you see [yourself] at some stage writing from scratch again?

TS Starting from scratch is a very, very daunting project when you have a million line

DirectX 7.0/8.0 and basically hardware T/L, the third generation is focused on DirectX 9.0 and beyond hardware as an absolutely minimum spec.

We expect it'll start shipping in the late 2005 timeframe and beyond. With each generation of the engine, you've typically seen us and our partners release games for a period of three to four years following the initial game, so for the second generation engine which debuted in 2003, there are some great games coming out next year using it, for example.

C Unreal 2 didn't get the best public reception. How do you feel the game has turned out in hindsight? What could have been done better?

TS Unreal 2 ended up being a really solid single player game but it wasn't Unreal as much as it should have been. If you look back to the original Unreal there's several things



ABOVE: A horned ugly monster – pumping some seriously Unreal detail.

code base. I think that the turnaround time to start the engine from scratch is probably five years. I wouldn't expect [to be] doing anything completely from scratch, but every three or four years we do a major significant overhaul of the engine, taking into account the latest hardware capabilities. We've done that once so far with our release cycle with our second generation engine. We're actually about a year and half into developing the third generation Unreal engine. Whereas the first generation was focused on software rendering and second was focused on

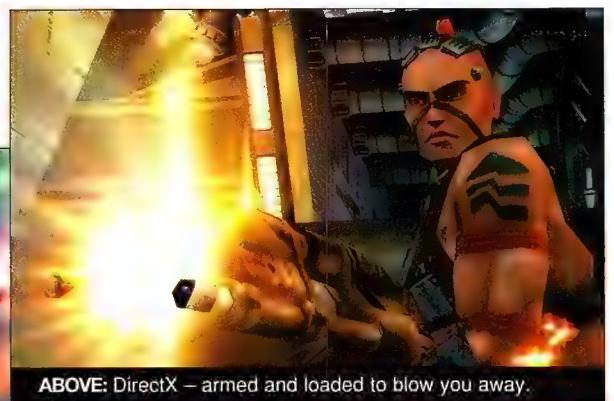
which really defined it [like] exploring really large levels that aren't necessarily linear.

Unreal 2 really missed out on several of the things which made Unreal 1 stand out. . . You know, very mission-based and dialogue driven, which is a first in the Unreal franchise. In retrospect, that wasn't necessarily the right way to approach a sequel to Unreal.

C Do you feel the art direction should have been more towards the 'surreal' side or that perhaps the game was built too much around the engine rather than design?



ABOVE: 'Get out of the stinkin' car and follow me, you pussy!' Vehicles will make for an interesting new addition to the Unreal Tournament game world.



ABOVE: DirectX – armed and loaded to blow you away.

TWell, both of those statements are really accurate. For one, Unreal – the game has always had the style of reality on steroids. Having the ultra dramatic lights everywhere and the really dramatic scenes, which is not quite what you see in real life but is a dramatisation of real life. And Unreal 2 went more for realism rather than 'realism plus,' which has kind of driven it a little bit away from the original idea of Unreal. The other thing is that Unreal 2 isn't the first game to ship with its generation of technology, so it wasn't showing things never seen before, whereas the original Unreal certainly did.

C Some say the first person shooter genre is pretty much done to death. But each year, new ways of expressing the genre are found – war-oriented shooters are currently very successful and Max Payne 2 experiments with a love plot. What do you think the first person shooter will evolve to in the coming years?

T When people talk about the death of the genre, I really see it as splitting off in a bunch of directions.

Innovation is actually going really strong in a lot of those different genres, but it's not like there's this one genre where there's a big event with the release of new games anymore. It's really fragmented and I think that can be expected. When Doom came out for example, it was a really novel thing for a game to be 3D, now almost all games

are 3D. With 3D there's really two options: 'first person first person', or zoomed out tactical view like a realtime strategy game. And if you break it down, there's really a limited number of options there. So innovation occurs on the gameplay side rather than the whole idea of being in first person.

C The second generation Unreal engine focused on increasing geometry output. Why was the emphasis placed on geometry rather than rendering? How do you feel about this decision in hindsight?

T That was the decision for the DirectX 7.0/8.0 and early DX9.0 timeframe where you have this incredible amount of geometry processing power.

Until DX9.0 came out the whole idea of pixel shaders from DX8.0 was really a misnomer – there was a very small set of fixed combinations so you couldn't do accurate per-pixel effects, you couldn't do per pixel lighting.

C So DX8.0 wasn't the real thing in terms of pixel shaders?

T The big thing there is it has a huge amount of computing power where you can look up textures [and] random access data sources – it's not just your texture map and normal map but you can do a serious amount of computation there so you can come up with arbitrary graphics algorithms

and run them. You can do that with DX9.0 now but with DX8.0 it was really a fixed function pipeline with more options than we've had in the past. It wasn't enough horsepower to do really realistic dramatic shadowing or realistic glossy objects. So you had scenes with a lot more geometry than, but basically the same pixel quality that the games have had in a long time.

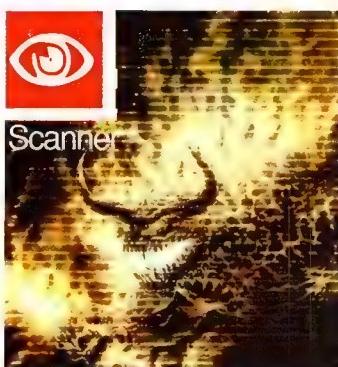
If you look [at] Half-Life 2 that's coming out next year, it's kind of a hybrid in between – their levels are immensely diffused textures and their models are mostly normal mapped. It's going to be a couple of years before games come out that are really taking advantage of full dynamic lighting absolutely everywhere, with full bump mapping on every object and every scene. It's just really a matter of hardware horsepower. Until around 2005, there are not going to be enough gamers with fast enough graphics cards to do that. So the goal of the game developers is to hit the sweet spot of the market; you want to have some leading features to show so people who spend on computers can show off, but you really have to be able to run at a decent framerate on computers going back 18 to 24 months. For games shipping in the last couple of years, you really want to hit DX7.0 as your sweet spot, and nowadays you are looking at DX8.0, and in a couple years DX9.0.

JW

Next issue . . .

In the second part of our interview next month, Tim Sweeney talks about the technology for the third generation Unreal engine and that sexy soft shadowed demo at the NV30 launch.





ShortCircuits

Project Gotham Racing 2, the recently released racing title for Xbox, may be banned in Australia. Labor MP Paul Gibson has come out saying that the game encourages people to drive in a dangerous manner. The game has been singled out as it contains a level where players can drive past Sydney landmarks, which have been realistically rendered from photographs. In comparison, no problems arose with the first Project Gotham Racing game.

In a bizarre move – at least on the surface – Sony is releasing its PS2 console in China with no anti-piracy protection. According to sources, the release is likely just a quick cash-in before the company's next-generation gaming platforms come out.

Player's of Day of Defeat will be happy to learn that the version 1.1 patch is now available. Gamers can grab the download off Steam. A list of changes can be found here: http://steampowered.com/platform/update_history/Day%20of%20Defeat.html.

Buzzwordikan

RTS

Back to the basics this month for buzzwordikan. An RTS, or real-time strategy, is any game that involves the management, control and distribution of units, buildings and resources to achieve a goal - usually the destruction of an opponent - in real time.

Be Gandalf!

The first *Lord of the Rings* strategy game is out! Logan Booker tackles Liquid's Ed Del Castillo.

While the developers of first-person shooters are more than happy to discuss their new, sparkly graphics engine and the tech that powers it, realtime strategy developers are often tight-lipped or, more often, unaware of the specifics behind their game.

That's why it was refreshing to chat with Ed Del Castillo, president of Liquid Entertainment, about his company's recently released RTS, *LOTR: War of the Ring*. *WotR* is Liquid's second RTS title, with *Battle Realms* – its first – one of those silent successes we played but never heard much about. A shameful situation, considering many strategy titles today share *Battle Realms'* look and feel – including Blizzard's *Warcraft 3*.

'It's an interesting thing because a lot of the abilities that are in *Warcraft 3* can be seen ... in *Battle Realms*', says Ed. 'We like to say it's [War of the Ring] a successor to *Battle Realms* although some people like to look at it as a successor to *Warcraft 3*. We chose a very vibrant style in *Battle Realms* and... *War of the Ring* on purpose, and probably for the same reasons that *Warcraft 3* chose them.'

'In a game where you're moving large numbers of units around on a board... quickly, and you're trying to absorb a lot of information... the things that catch his [the player's] eye are incredibly important,' says Ed.

Liquid has put a lot of effort into *WotR*'s engine, specifically to take advantage of faster processors and better graphics cards. Two features of the engine that are particularly interesting are the dynamic weather model and the particle engine, which is responsible for most of the game's special effects.

'We wrote our engine from scratch. One of the things that we wrote was a particle engine ... which creates all those special effects in terms of things that are transparent ... revolving [etc].'

'We have whole new particles that use what we call 'per-poly collision,' says Ed. 'In addition to that we have reflections happening in realtime, especially on the water. It's also a dynamic[ally] animating mesh water.'

The list of the engine's features doesn't stop there though. 'Part of the weather system keys on a wind model that we have in the game... like wind, it varies in direction as it goes, and... affects a number of things... [like] ripples on the water... The wind actually pushes clouds along – clouds drift through the sky – so you'll get to see that.'

'We also have grass – each and every blade is modelled individually. Not only do they push aside when units walk through it, the wind also causes the rippling wave effect in the grass itself,' he says.

'In addition . . . all of this is home-grown, which is why we're proud of it. None of this is using anybody else's middleware. We wrote it all our[selves].'

The game also incorporates a 'fully animating cloth engine' that allows for some variation in unit and building animations, based on the strength and direction of the wind.

'Somebody once said to me: "God is in the details"... so many of the games we play today just don't make the mark... they have the basics you need to get that gameplay across and they don't go into the small details.' Ed believes this is the key to a good RTS.

With all this packed into one game, you'd think Liquid would be out of ideas for its next project. However, according to Ed, the developer has only just started: 'We are talking to Vivendi about both an expansion pack to the existing game and a sequel. And we're committed to doing it.'



ABOVE: Individually modelled blades of grass... almost a shame the units are trampling them.

Over 300 PC games are launched a year, and 100 of these will really tax the graphics hardware. Maybe a half-dozen - the ones most used as benchmarks - will receive the gentle caress of the driver engineer.

ATI's PR Director Chris Evenden, on driver optimisations.

Developer Quote of the Month:

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Call of Duty

John Gillooly finds his camos for one more beach landing.



Specs



Which way to the aliens? Oh, it's Nazis we're after now...

Developer:
Infinity Ward
www.infinityward.com

Publisher:
Activision
www.activision.com.au

Distributor:
Activision
www.activision.com.au

Phone:
Activision
(02) 9869 0955



Another revolution of the game bad guy wheel is complete and Nazis have officially snatched the reins back from aliens as the cannon fodder of choice. There have been a hell of a lot of WWII-based first person shooters over the past few years, and Call of Duty continues this tradition by letting you take Nazis on from both sides as you play through American, British and Russian missions over the course of the Allied forces' spread over Europe.

Call of Duty is not without its faults, but it is one of the most enjoyable examples of this sub-genre so far. Dispensing with any notion of coherent narrative, the game consists of missions that take place over the breadth of Europe, in which you play low ranking grunts taking part in everything from SAS raids to the re-taking of Stalingrad (it wouldn't be a WWII game without a beach landing of some-sort).

The experience is intense, thanks to generally good AI and spectacular use of sound and visuals. Infinity Ward has taken the ancient Quake 3 engine and polished it into something unrecognisable, with amazing lighting and particle effects giving the game a carefully measured dose of moodiness. The sound is crisp and boomy; this is one of those games that deserves a good volume cranking to get the most out of it. As artillery rains

down, snow falls and bullets zip by overhead in the heat of battle, it all adds up to an incredibly immersive experience.

At heart this is still an incredibly linear corridor shooter, and it's quite a short game, but it is a damn good title. As far as immersion and action goes, this is one of the finest releases of recent years. It may be lacking in depth, but for a visceral, immediate experience, there is little that comes close.



REQUIREMENTS: 700MHz CPU; 32MB DX7.0 level video card; 128MB RAM.

RECOMMENDED: 1GHz CPU; 64MB DX8.0 level video; 5.1 speaker audio system.



Uru: Ages Beyond Myst

Make no myst-ake, says Allison Reynolds. Uru: Ages Beyond Myst ain't easy.



Specs



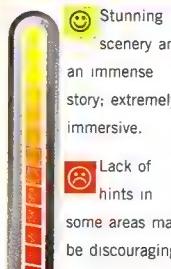
A cable car descends into Giant Mushroomland. Will you?

Developer:
Cyan
www.cyan.com

Publisher:
Ubi Soft
www.ubisoft.com

Distributor:
Ubi Soft
www.ubisoft.com

Phone:
Ubi Soft
(02) 8303 1800



Ever gone for a remedial massage? Ambient music, tranquil murals, all inviting you to lie back and relax while some jandal-wearing sadist pounds you into another shape. Playing Uru: Ages Beyond Myst is much the same experience. You may come out of it feeling pretty good, but while you are playing this adventure game, your brains are leaking out of your ears.

Launching your personally designed avatar into the New Mexican desert, players are introduced (with help from a friendly

trailer trash dude) to a couple of fairly tame tasks to get warmed up for what's to come. Success here allows you to travel to the remains of the dead civilisation of the D'ni and utilise their unique method of reading books to move through the ages. And what ages! Looking like a series of drug-induced hallucinations, giant mushrooms, bubbling lava and creepy caverns are beautifully done, plus they're full of mind ripping puzzles to restore life to the D'ni cities.

Myst and Riven fans will recognise various references peppered throughout Uru, and old schoolers will need to adjust to first/third person controls that have superseded the old 'click and go' (check the options if you really can't live with the newfangled views). Navigating between ages is easy and intuitive, which is a good thing as transporting can keep you from going insane when a task in your current age seems impossible.

To prolong the game further, Uru: Ages Beyond Myst will be playable online where interaction with other players and new ages will be available, for a monthly fee.

This game will appeal to hardcore adventure fanatics and those that want a game that involves more than wading through gibbs with a big gun. To finish will be an achievement. It will also do your head in; ensure your health insurance covers mental hospital treatment.



REQUIREMENTS: 800 MHz CPU; 256 MB RAM; 32 MB T&L video card.

RECOMMENDED: 1.4GHz CPU; RADEON 9800.



Hidden & Dangerous 2

Join the SAS for a jaunt through WWII with Private Ed Dawson.



Specs



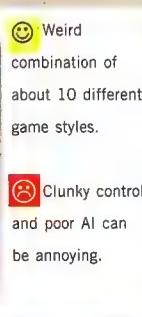
Developer:
Illusion Softworks
www.illusionsoftworks.com

Publisher:
Gathering
www.gathering.com

Distributor:
Take 2 Interactive
www.take2games.com.au

Phone:
Take 2
(02) 9482 3455


Weird combination of about 10 different game styles.


Clunky controls and poor AI can be annoying.



Hiding from a German patrol is about to get a lot more dangerous.

Hidden & Dangerous 1 was a military stealth-adventure with a bit of sniping in it. The sequel is an epic concoction of every single form of military computer game, short of realistic vehicle simulations.

Hidden & Dangerous 2 combines squad-based tactics and strategy, third-person stealth, piloted vehicles with crew slots, first-person sniping, a detailed turn-based command system, a huge range of

first-person weapons and scuba diving. It's also very tough. The landscape looks nice, the animation is great and the character detail is superb.

You'll travel all over the world with the SAS, listen to lengthy instructions and then sneak into places and blow things up. Once you've spotted an enemy, you can see their field-of-view animated on the map screen, which is handy.

You can choose four different speeds of movement, three different stances and your squad mates can be given instructions to be aggressive, defensive or passive. Or you can give them explicit instructions from an isometric view, paused. Or, for a more personal touch, you can switch your active controls to that character and do it in first person view. Then you all get in a tank and drive it around.

The problem with all these layers of interaction is that the game seems to be suffering from multiple personalities. True, you can choose appropriate methods of control for myriad ranges of situations, but it would probably have been better to amalgamate these modes. They're like a mixed vegetable soup at best.

The game has substance, but you'll struggle to notice while you're wrestling with the convoluted controls.

ED

REQUIREMENTS: P3/Athlon 1GHz, 128MB RAM, 2.4 HDD, 32MB DX 8.0 video card.

RECOMMENDED: P4/Athlon 2GHz, 512MB RAM; 128MB DX 8.0 video card.



Need for Speed: Underground

Like 2 Fast 2 Furious, Nathan Davis feels NFS: Underground should be seen only once.



Specs



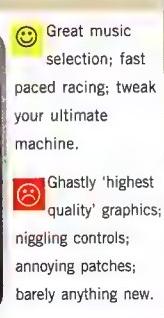
Developer:
Electronic Arts
www.ea.com.au

Publisher:
Electronic Arts
www.ea.com.au

Distributor:
Electronic Arts
www.ea.com.au

Phone:
Electronic Arts
(02) 9264 8999


Great music selection; fast paced racing; tweak your ultimate machine.


Ghastly 'highest quality' graphics; niggling controls; annoying patches; barely anything new.



All things wet and reflective – most shiny game ever.

Making its debut as the umpteenth instalment of the Need for Speed franchise, Underground is focused on the underworld of racing – speeding and showing off your four-wheeled beast on urban streets. Same ol' in a new disguise, really, though this time there's no nagging police or choppers tossing blazing explosives at you – just fast rubber-burning racing.

For graphics, compared to Hot Pursuit 2 for example, it has been 'shined up', with a shine effect

applied to every second object. However, the overall look is rather painful – low quality textures even when in highest detail and the 3D models when not in the game are very low res. It was obviously designed with the lowest common factor primarily in mind – consoles. What's this with leaving PC gamers to suffer?

Customising your beast is central to this game – and your success and reputation as an underground racing pro depend on it. Besides, those original wheel spikes just don't cut it (as your female guide puts it). There are tonnes of upgrades (for both performance and looks), but you can't access most until they're unlocked by winning matches – though you still have to purchase them. This was a dismal attempt to make it a long-playing game.

An online update is required in order to play online, but patches aren't available as a normal file – you

need to use an annoying browser plug-in to update. You aren't even notified how long it will take, you just get to sit and wait. The ability to play cross platform multiplayer games is an interesting addition.

Overall, the feeling of 'I gotta play that again' just isn't there. There's really nothing groundbreaking, it's just another on-the-streets racing game. Fun, yet very repetitive, but perhaps made a stayer by the mass of tweaking options – and drag racing. If either rocks your rubber, speed right this way.

ND

REQUIREMENTS: 700MHz CPU; 128MB RAM; 2GB HDD; 32MB video card.

RECOMMENDED: 1.4GHz CPU; RADEON 9800.



>out of control



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True Crime: Streets of LA

John Gillooly hopes this game isn't as crappy as the city it is set in.

Specs



Except for the Noisy Cricket, most of the weapons in the game are balanced.

Developer:

Luxoflux

www.luxoflux.com**Publisher:**

Activision

www.activision.com**Distributor:**

Activision

www.activision.com**Phone:**

Activision

(02) 9689 0955



Smiley face: Cinematic production, varied gameplay; huge city to explore; great soundtrack.

Frowny face: Feels too derivative; branching campaign problematic.

Movies, music and gaming keep

getting closer, but rarely are they melded as well as in True Crime: Streets of LA. With stars like Christopher Walken and Gary Oldman providing voices, and a swag of west coast rappers on music, True Crime is one of the slickest games to hit consoles in recent years.

A nice mix of tried and true gameplay with innovative concepts arriving at a product that is familiar to a degree but different enough to stand out. There are three main

components of True Crime: GTA-esque running and driving, Virtua fighterish hand to hand combat and Max Payne-like shooting. All of this takes place over a series of missions set in an accurate rendition of LA.

You play renegade cop Nick Kang, plunged into a conspiracy involving Chinese and Russian gangsters. As you work your way through the story you find yourself jumping between the different game styles.

The campaign is unique in that it provides a branching storyline and the ability to continue after failing a mission (which itself affects the story). This extends the single player experience, and there is enough to do just cruising around LA to keep the game interesting (like finding the 30 hidden 'bones' that unlock the play as Snoop Dogg mode). When cruising you can also solve random crimes to earn experience that can be traded for new skills.

True Crime partially succeeds in its mission. The branching storyline is cool, but you can replay failed missions too easily, diminishing replayability. Failing missions also confuses the in-game cut scenes and you end up feeling like part of the story has been excised.

The different game modes are done well, and the fighting sequences are particularly fun, but there is nothing that lifts the game to greatness. When it comes to wasting time yet enjoying yourself, True Crime is highly successful. Thankfully it reinforces our suspicions that cruising around LA from the comfort of your living room is much more enjoyable than actually visiting the stinking place.

JG



Rainbow Six 3

Ed Dawson sets terrorists on fire, and doesn't feel guilty.

Specs



Check out them sexy effects. Sure makes you want to blow away those bad guys.

Developer:

Red Storm Entertainment

www.redstorm.com**Publisher:**

Ubi Soft

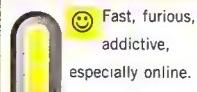
www.ubisoft.com**Distributor:**

Ubi Soft

www.ubisoft.com**Phone:**

Ubi Soft

(02) 8203 1800



Smiley face: Fast, furious, addictive, especially online.

Frowny face: Sadly the enemy AI is a bit sloppy.

Competition is becoming intense for the crown of best anti-terrorism shooter on the Xbox. What's the difference between Rainbow Six 3, Splinter Cell, or Counter-Strike, you might well ask yourself?

Rainbow Six 3 is a great all-rounder. It's visually rich and is a solid single player game (unlike Counter-Strike). It also has a great multiplayer mode (unlike Splinter Cell for Xbox). But, it's a very straightforward,

twitchy combat game (unlike Ghost Recon). You've got simplified squad tactics and white phosphorous grenades which set people on fire.

In the game you're the leader of a global anti-terrorism team which is cleaning up messy situations around the world. You'll kick open doors, defuse bombs, tie up hostages and shoot anyone and everyone wearing the wrong facial expression.

You're supported by a trio of counter-terrorist buddies, to whom you can give orders by looking at things and pressing A, or by speaking into your Xbox headset. This works surprisingly well. Saying, 'Open, flash and clear on Zulu' will cause the team to pause outside the door you're looking at, waiting for the signal. You then find another door, setting up a crossfire into

the same space. 'Zulu Go!' you bark into the headset. Your team answers via radio, opening the door a crack, tossing in a flashbang, then storming in.

As they do this, you can simultaneously open fire on the terrorists from a different angle.

No matter how well thought out a controller based command system is, nothing works as slickly as screaming orders into a microphone

Overall, Rainbow Six 3 is a slick action game for Xbox. Rather than being a pure port, it's well streamlined for the console environment, has a tasty looking engine, plus it's great fun online. Recommended.

ED



Magic lemons



Mark Cooksley was the tallest player to ever play for the New Zealand All Blacks, measuring a massive 2.06 metres (6'7"). He only managed to score one try through his entire career (1992-2001).

It's the fruit that everybody wants! It's tasty, juicy *and* mystical! Dan Rutter swears by them – apparently they power his special fixification abilities. While we can't give IOOTM a magic lemon, we can happily provide them with a Logitech MX700 mouse.

OOT

Asymmetrical multiprocessing

I A few years ago, I brought a Gigabyte GA-6VXD7 P3 Dual Motherboard and at the same time a Pentium 3 866MHz. I set up the PC as a server for the last several years, but couldn't find a good price for a second CPU. A friend of mine recently gave me a Pentium III 800EB though.

Is it possible to lower the multiplier on my 866MHz CPU to run at 800MHz, and use the 800EB processor as my second CPU? Both are 133MHz FSB CPUs, but I know dual CPU can only be used with identical CPUs. The motherboard only has one DIP switch for the multiplier.

Also, if this can be done, will the performance difference be great? I mainly use the machine to host Apache and MySQL on Win2000.

King Lam



ABOVE: One of these CPUs need not be like the other.

O First the bad news: No, you can't change the multiplier of either P-III, unless they're non-retail engineering samples. Every other Intel CPU since before the first P-III's has a locked multiplier.

Now the good news: It doesn't matter. Yes, SMP stands for Symmetric Multiprocessing, and that suggests that the CPUs ought to be the same speed, and indeed they usually are. But it's actually OK if they're not.

Just plug the second CPU in, and it should work with the first one. Windows shouldn't miss a beat. Note that many motherboards don't give you much in the way of independent settings for the two CPUs – maybe separate voltage settings, but that's it – so mixing processors that want different FSB speeds can be a problem.

You're not doing that, though, so you'll probably be fine.

Whether you'll notice a difference is another question. A web and database box like yours certainly *can* benefit from more processor power, but only if it's actually loaded heavily enough. If it's not floating around 100 percent CPU utilisation very often at the moment, then the second processor won't do much for it.

PATA plus SATA

I I have an MSI K7N2G-ILSR motherboard and two WD 120GB hard drives plugged into IDE. I was wondering if I can buy a SATA hard drive and use it as well on top of the existing two?

Jordan Xu

O Yes. The ILSR version of the K7N2G runs its two SATA ports, and its third PATA port, from a separate Promise 20376 controller chip. Some motherboards allow you to use a couple of SATA ports only if you don't use one PATA port, but the K7N2G-ILSR lets you use all of the connectors simultaneously, for a maximum of six PATA devices and two SATA devices at once.

Universal 1394 Bus

I I was recently given a USB2 drive enclosure, which is great, except that my Inspiron 8200 laptop only has USB1.1 onboard. It does have FireWire though, so I thought that I'd be able to get a converter to run the USB2 drive off the FireWire port. But, after a long Google and online computer store search, it would seem that no such USB/FireWire converter exists.

Is there a technical/legal reason for this, or did I just not look hard enough?

Dan Sketcher

O I don't think it's technically impossible to translate FireWire into USB, though the fact that high speed USB 2.0 has a higher (theoretical) data rate than FireWire (480Mb/s versus 400Mb/s) could be a problem. The main reason why nobody's bothered making such a device, though, is that there are few situations when you can't just install a USB 2.0 adaptor in the computer that needs one.

In your case, if your laptop's got room for another Type II PCMCIA card (the Inspiron 8200 can accept two Type II cards), you shouldn't have any trouble finding a USB 2.0 adaptor for it. Expect to pay \$75 or less for a perfectly good off-brand card.

It's a RAID!

I I was reading *PC Authority* (every Atomican's second-favourite mag) and noticed that the Seagate Barracuda ST3160023AS 160GB hard drive cost \$264, and the Western Digital Caviar WD2500JD 250GB hard drive cost \$589.



ABOVE: It's surprisingly quiet at seven volts, you know.

I was thinking – why buy the Western Digital when you can buy two Seagates and a RAID controller, run them in a RAID 0 array, and get more storage plus the benefits of striping?

I know what you're going to say – 'Why not get two 250GB hard drives and run *them* in a RAID array?' An excellent point with just two problems.

1. Who has over \$1K to spend on hard drives?
2. Who needs half a terabyte of hard drive space (OK, maybe 400GB after formatting.)

Don't know how to set up a RAID array? That's fine, get your sister's boyfriend's ex-flat-mate's cousin's best friend to set one up - or pay me to do it!

Ben Halpin

O Sure, you can RAID a couple of cheaper drives to get more capacity than a high-end one offers. You can probably even boot from the array. However, RAID 0 is not really RAID (Redundant Array of Inexpensive, or Independent, Disks), because it has no data redundancy; there's zero fault tolerance. If any drive in a RAID 0 array fails, the array is toast and you can't do anything but reformat the surviving drives.

For this reason, bare RAID 0 is generally only used for high-speed storage of intermediate data, like video being edited.

You're not talking about a 16 drive array, of course - just two. Only two times the already pretty low failure probability of a commodity drive isn't especially terrifying. You can just take the risk and probably be fine, especially if you make regular backups (which you should do anyway), and retire the drives to less important duty when they're a couple of years old.

If you want fault tolerance, though, you either have to go to RAID 0+1 (a striped array mirrored to another striped array, requiring twice as many disks for the same capacity) or RAID 5 (a striped array with parity information also striped across the drives, requiring 1.5 times as many disks for the same capacity). A three drive RAID 5 array can survive the death of any one drive; a four drive RAID 0+1 array can also endure any one drive failure and also survive a

second, provided that drive wasn't mirroring the first one that failed.

Cheap RAID controllers pretty much all support O+1. You generally have to pay a bit more to get RAID 5, or do it in software with the Server Windows variants, or Linux or FreeBSD or what have you, but then you can't boot from the array. Either way, of course, you're not getting that great a dollars-per-gigabyte bargain any more.

Fan-a-rama

I I have recently purchased an 800MHz FSB P4 2.4GHz and an ASUS P4P800, which I have overclocked to 3GHz. However, when I had it up to 3.3 GHz, it tended to freeze under load.

I have since purchased and installed two case fans to assist (and to provide blueness, aaah). However these have dramatically increased the noise (I have a quiet power supply). The Intel cooler is very quiet, especially while it is below 50°, as the motherboard drops the speed while the temperature is low.

Can I connect the case fans to the same monitoring and speed control as the CPU cooler, so that while the CPU is cool all three fans run slowly, and increase when required? If not, can you suggest another way to automatically adjust the case fan speed based on the temperature?

David Walters

O Maybe, although you're unlikely to be able to find a pre-wired adaptor that'll let you do it.

What you want to do is connect the positive and ground wires for each of the case fans (probably red and black, respectively) to the positive and ground wires of the CPU cooler fan, so all three fans are wired in parallel. Only one fan's tachometer wire (assuming they all have them; tacho wires are generally white or yellow) should be passed through – the other two should just be snipped.

This will work, provided the aggregate load of the three fans is not too high. It might be, particularly since the system will probably run its fans at full power for a moment at startup, and fans draw maximum current when spinning up from rest.

A lot of LED-lit case fans only draw a couple of watts (if the fan only has a current spec on its sticker, multiply current in amps by 12 to get the power rating in watts), but the P4 fan will probably draw about 2.9W on startup. Your motherboard manual may tell you the maximum power rating of your fan headers; it's not likely to be much more than 4W per header.

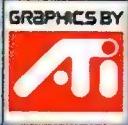
To reduce the current draw, you could use non-lit fans with similar power, which are likely to draw almost a watt less. Glowy fans will be dim when running below full speed anyway, so you could use some separate decorative lights. You'd still be pushing it a bit if you want three fans running from one header, though.

Anyway, ignoring power supply problems, the most elegant way to do this would be with a three-way adaptor with one plug and three sockets, which anybody handy with a soldering iron could knock together for you in 15 minutes, given the parts. You could also hardwire the setup, by just hacking the plugs off two of the fans and splicing wires.

And yes, there is another way. There are lots of fan speed control devices that have thermostat functions. The good old Macpower DigitalDoc5 is probably still the most popular of them, but there are plenty of other options.



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Dang, y'all.

Here's a quick and easy one for you. This will give you UNIX-style command line completion in a Windows command prompt, also known as DOS boxes. If you have no idea what I'm talking about, when you open a console in Linux, for example, the 'Tab' key will auto-complete file names, or folders after you type the first letter. This is similar to the auto-nick-completion seen in mIRC.

Windows XP users already have this feature enabled, so this is for NT/2K systems. In the registry browse to **HKEY_CURRENT_USER\Software\Microsoft\Command Processor**. If it doesn't already exist, create a REG_DWORD and call it CompletionChar. Give it a Hex value of '09', which represents the 'Tab' key. You can assign any key you like, but the Tab key is the only one that has no real use in the Command window. You will need to reboot for the changes to take effect, but it works like a charm.

This tweak was submitted by 'Zeromancer'. Schweet!

Back in issue 35, I asked for help on removing the pathetic animations from the XP search screens. I was swamped with offers ranging from skinning the puppy alive, through to something about dead bunnies. Well, thankfully not everyone is a psychotic nut. Here is a small selection of some of the other suggestions.

Wazza, MoRoSiS and iNTiGOD suggested this registry hack:

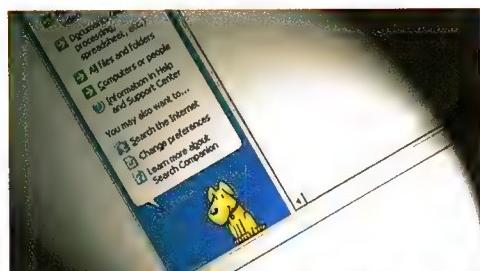
Browse to: **HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Explorer\CabinetState** and add a new String (REG_SZ) called Use Search Asst and set it to 'No'. Then in **HKEY_CURRENT_USER\Software\Microsoft\Internet Explorer>Main** set Use Search Asst to 'No'.

This is for the Current User, however. Should you want to bury the puppy for all users, then 'Duffy' suggests navigating to **HKEY_USERS\Default\Control Panel\Desktop\WindowMetrics**, then modify or create the Value Data Type(s) and Value Name(s) as detailed below.

Data Type: REG_SZ [String Value] // Value Name: MinAnimate

Setting for Value Data: [0 = Animations Disabled / 1 = Animations Enabled]
And of course, do the reboot dance.

'Benxor's' solution was short and sweet:
• Click Start, Run, and enter '%systemroot%\inf'
(or even: c:\windows\inf)
• Click Ok to open the INF folder.



ABOVE: Do you skin it alive or tw33k the registry instead?... Dilemma.

- Locate the file Srchassist.inf
- Hurt it.

Paul Aslin suggests that un-registering the appropriate .dll should do the job cleanly. From a command prompt type "regsvr32 C:\WINDOWS\srchassist\srchui.dll /u"

With that .dll un-registered, Windows won't use it. Of course, if you miss the dopey little animations, just re-register the .dll by typing "regsvr32 C:\WINDOWS\srchassist\srchui.dll", from the nearest command prompt.

'Cordo' simply deleted the windows\srchassist\chars and the windows\msagent\chars folders.

I had a suggestion from 'HeNrY' that I rename the entire srchassist folder. It's a little tricky to do as Windows considers that folder as 'in-use', but you can work around that with a few little tricks. If you managed to rename the folder, it will cause some interesting errors on reboot, as Windows will think that there is system problem. The directory will be recreated, but with nothing in there.

Finally, neophyte recommends entering this into notepad:

```
[HKEY_CURRENT_USER\Software\Microsoft\Search Assistant]
"SocialUI"=dword:00000000
"UsageCount"=dword:00000001
"UseAdvancedSearchAlways"=dword:00000001
then save it with a .reg extension and run it!
```

A number of people suggested utilities such as Power Toys, TweakUI, and Xteq. Whilst these utilities are not without merit, we prefer to get our hands dirty. Why get a mechanic to work on your car, when you can dive under the bonnet yourself? Thanks to all those who sent in their suggestions.

Feedback is always welcome.

Let us know how Phr33x Tw33x has helped. Tell us your tweaking stories. Is your PC running faster and smoother, or does it run like a donkey? Did you do before and after bench-testing? What results did you get? Have you got a tweak that we haven't seen yet?
phr33xtw33x@atomicmpc.com.au

DISCLAIMER:

The following tutorial involves the use of highly corrosive materials. At all times, use appropriate protective clothing, gloves and eyewear. We recommend that you use non-ferrous (plastic!) forceps when handling all materials in this article. Do NOT allow the materials to come into contact with foods, or food preparation surfaces.

Please also be advised that the corrosive materials will destroy ferrous materials such as sink holes, taps and other Fowler ware.

Please also observe your local regulations in regard to disposal of toxic materials with heavy metal content.

AJB Publishing and *Atomic* claim no liability in your execution of or ability to follow these instructions nor is AJB Publishing or *Atomic* liable for any damages that may arise from the instructions contained within.

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Techjitsu

Rollin' your own board

Printed circuit boards (PCBs) are the foundation for our silicon existence. Make your own with Phil Chia.

PCBs, or printed circuit boards, are the cornerstone of modern electronics, and in this issue of TechJitsu, we're going to show you how to roll your own. Forget silicon, without the PCB, the silicon is useless! PCBs are used because they provide a stable and robust substrate upon which we can mount components. Like electronic circuits, they vary in complexity.

At the simplest level, PCBs just have tracks on one side and connect components together. However, the latest video cards feature PCBs that are as complex as six layers, essentially making them integrated circuits.

PCBs essentially comprise two bonded materials: copper is usually bonded onto an inert non conductive substrate such as fibreglass or polycarbonate. In manufacture, the copper is usually etched into shapes known as tracks or traces, which act like wire connections between the components. Copper is used in PCBs not only because it's the best conductor next to silver (which is sometimes used in critical scientific or audiophile circuits), but because it's easy to etch with chemicals such as ammonium persulphate and ferric chloride, and works well with conventional low heat 60/40 soldering (see *TechJitsu*, issue 35).

The downside to using copper is that it tarnishes easily. A simple fingerprint can tarnish a copper surface in under an hour, effectively rendering the surface useless for electronics use. So, like soldering, the golden rule here is: cleanliness, cleanliness, cleanliness!

There are three main ways that PCBs are prototyped; however, the general aim is the same. Basically, 'artwork' featuring the tracks and pads of the circuit are laid down onto the copper with etchant-resistant material ('resist'), the PCB is then dunked into an etching agent, and any copper that is not protected by the resist material is eaten away. Usually a solution of ferric chloride or ammonium persulphate is used. The resist material is then removed, revealing the copper tracks which are then ready for soldering.

Artwork is usually put onto prototype PCBs (read hobby or short-run stuff) in one of three ways: Dalo Pens,

Press-n-Peel Blue or Riston. We'll concentrate on the first two in this Techjitsu.

Briefly, Du Pont Riston is a preferred method used by commercial fabrication plants because of its excellent resolution for really fine work. The resist material is already fabricated onto the copper, and requires UV activation. Unlike Press-n-Peel, this requires that a *negative* artwork be made. In commercial environments, an actual film negative is produced, however most hobbyists usually use overhead transparency film. The board is then exposed to UV light, quenched in developing solution, then etched. Riston has the benefit of being able to produce high-detail PCB work (essential with surface-mount circuits) and also allows for short production runs as the film negative can be reused. However, these PCBs cost the earth, the UV lights are hard to come by (although in uni we just counted on a harsh Adelaide 40°C day, which seemed to work – but you'd be stuffed in Melbourne or Tassie), the chemicals are also expensive, it takes time, and generally it's just too much of a pain in the arse to work with.

Whichever method you use though, the general process stays the same: prep the PCB, add resist, etch, drill component holes and protect the board.



Prep work

Bits:

- Methylated spirits
- Acetone
- Isopropyl alcohol (Lab grade)
- Scotch-Brite pad equiv to steel wool #0
- Tissues

With all PCB prototyping, you need to 'prep' the board to make sure that the copper surface is free of contaminants and marks. From this point on, handle the PCB only from the edges, and

preferably with gloves.

First of all, wash down the board with soap and water. Use the Scotch-Brite pad to scour the surface gently. Dry the board and the Scotch-Brite pad, then scour using methylated spirits until the copper surface shines up and looks bright.

Next polish the surface with a tissue soaked in acetone. Let it air dry, and follow up with a final polish with isopropyl alcohol. Examine the surface. It's important to use good lab-grade isopropyl alcohol to finish off, as this will leave no residue. If you get residue, you need to go over again with the acetone, then buff off using a clean tissue. This residue is usually caused by oily contaminants in the processing of the solvent. This can lead to disaster by either preventing the resist from adhering to the copper or, worse still, preventing the etchant from working correctly.

Doodling away

Bits:

- Dalo Resist Pen, 'Action Marker' Fine Line #33, PC- 301 Blue
- Copper laminated fibreglass PCB

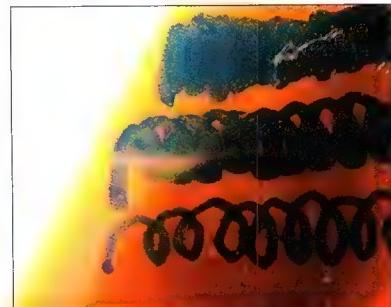


The easiest, quick and nasty way to produce a 'quickie' PCB is by using a Dalo Pen. Basically, think a felt-tip pen loaded with resist material. These pens cost anywhere in the realm of \$8 - \$10, and are as easy as pie to use. Field engineers have been known to

just 'doodle' a circuit freehand, however, when you're starting out, it's easier to trace the artwork onto the copper with a bit of carbon paper. The process of putting down the resist is about as low-tech as it can get – just draw it on!

A few tips though: keep your pen strokes nice and even, and try and make your tracks one continuous movement. This avoids a problem where, if you lift up your pen, sometimes the resist will not seal over itself.

Secondly, if you must retrace your tracks, or if you want to make larger tracks, build it up by 'layering' and overlapping previously drawn tracks [498]. Another technique is to make your tracks by drawing them in small overlapping circles.



Finally, before etching, go over your PCB with a powerful magnifying glass and identify any potential breaks in the circuit. When that's all done, just whack the PCB into etchant, and then strip with acetone.

The Dalo Pen can also be used to 'touch up' resist artwork put down by other techniques, including Press-n-peel.

Press-n-peel

Bits:

- Press-n-peel blue resist film
- Access to a photocopier and printer
- Artwork
- Toilet paper
- Clothes iron

Press-n-peel is the electronic engineer's equivalent to sliced bread. This stuff is wonderful, and isn't just limited to making PCB tracks; I've got friends in art school who've used it to make fantastic effects on metal works pieces. This stuff is acid- and etchant- (ammonium persulphate and ferric chloride) resistant, so you can let your imagination run wild. It works simply by bonding the photocopier toner (which gets sticky with heat) onto the copper. The areas not printed with toner don't stick and simply peel away.

The first thing to do is prepare your artwork. You can use anything from MS Paint all the way up to professional tools like ProTel to make the artwork; we're going to make a decorative plate here, so I've just used the *Atomic* logo as an example.

After getting your artwork down, make a mirror image in your image editor, and print it out on your printer. It's important to make the resolution as high as possible, and as dark as possible, with maximum contrast.

Now you need to transfer the artwork onto a photocopier. A few tips though. First, run a few 'white' copies by putting a blank white sheet on the plate, and examine the output. Every copier has a sweet spot where output is pure white and undistorted. Also, you want to check the exposure level. If your copier makes streaks or has little dots all over, then it's useless for transfer. The only solution is to find another photocopier. Now, presuming that the copier's OK, adjust the exposure so that there's no background. Now make two 'black' copies by leaving the cover off the copier, and then make another two white copies, again checking to see if there are any streaks or dots on the output. This process basically 'cleans' the print drum and gives you the best possible results. Using the transparency bypass tray, print your image on the dull side of the film.

You can print directly onto the Press-n-Peel from your laser printer, but I've always felt a bit uncomfortable with this. Laser printers are precision machines with delicate internals, as opposed to photocopiers. Also, if you don't have a laser printer, then this is the only way to get the image onto your film successfully.

To transfer the resist, first trim and align the Press-n-Peel ▶

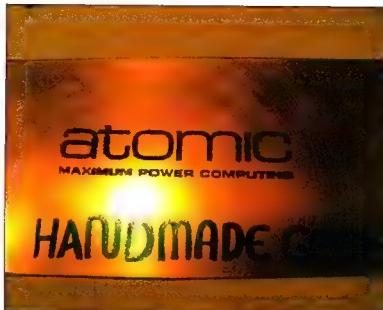




over the PCB on the copper side. Make sure that the printed surface is on the copper, and the shiny surface is facing you. Preheat the iron and set it onto medium-high heat. Place the sheet of paper on top of the Press-n-Peel (make sure it doesn't move!), then press the iron onto the sheet firmly for about 10 seconds. Now, slowly iron over the PCB. The aim is to heat the PCB to the point where the toner melts onto the copper. It's vitally important that the PCB and the film are all kept stable and do not move in

this process. Any movement could result in smearing of the resist material. A good rule of thumb for when to stop is that the paper under the iron should just begin to discolour.

Take off the iron, leave it to cool, and take the PCB, using the toilet paper underneath, to a tap. The PCB is hot at this point, so be careful! Quench it under cold running water, and the film will either fall off or peel off easily. Dab dry with more toilet paper, inspect the resist left on the board, and 'tidy' it up by either scraping excess resist with an X-Acto knife, or adding more resist using a Dalo Pen.



PROTECTION, especially goggles and gloves. Also, this stuff will eat away anything metallic, so keep it away from taps, sinkholes and the like. Ferric chloride can be made to etch faster by warming. Do NOT boil or heat on an open flame. Some tech labs actually microwave their etchant, and if you have access to a microwave that WILL NOT BE USED FOR FOOD, this is a fast way to speed up the etching process.

Add just enough etchant to cover the PCB, agitate, and check the progress of the etching periodically.

Ferric chloride goes a darker colour when its activity is used up, and the etched copper will go a bright pink when examined.

Generally, a PCB will be etched through in about 20 – 30 minutes, but will depend on the amount of copper on the board.

The pictured board had a lot of copper to be taken off, and required three changes of etchant.

Finally, after the copper has been etched, rinse off the board very well in running water, dry, and strip the resist with acetone.

Examine the tracks, trim excess copper with an X-Acto knife. Component holes can now be drilled. For smaller jobs, a vice-grip with a mini drill bit will suffice, however with the larger projects, a vertical press Dremel is recommended.

Size O bits are perfect for small components like LEDs, with a size 2/3 for general gauge wiring.

In order to protect the board from corrosion, it's good practice to 'tin' the copper with solder.

Heat a small square of solderwick with a soldering iron and melt some solder into it. Then run it over the surface of the copper, 'topping up' the solder as required. For aesthetic purposes, this board has been left mainly bare because shiny copper looks cool. Next, lacquer the board with solder-through electronics lacquer, and the mount the components (note the polarity) and hook up the power.

And there you have it – a fully customised copper PCB with 'live' electronics and an AtOmical PiMP plate!



Bits:

- Chemical resistant, non ferrous container (Tupperware is OK), but it MUST be free from grease/oil
- Acetone
- Ferric chloride (or ammonium persulphate)
- Plastic forceps
- Vice grip / Dremel
- Size O Micro drill bit.
- Few LEDs and a 3v battery.

Take the PCB and drop it into the container. Ferric chloride is preferable to ammonium persulphate as it is coloured (allows identification of spills) and doesn't need to be heated. Ammonium persulphate is cheaper, but it needs to be mixed with hot water to work.

Both are bloody corrosive, so I can't stress enough WEAR

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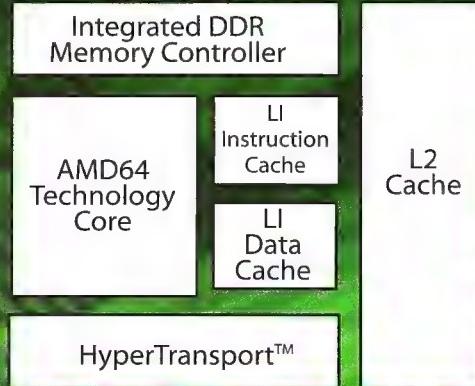
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O!



④ PS2 Jak II figurine and game

Also famous for the Muckle Mannequin range of window dressing dolls, Muckle Figures of Germany make full mad sick collectible game characters. Sure, there's the predictable ones, like Lara, but really, who wants that? Not us, we'd rather Jak. Sony has just released Jak II, a fun and funky 3D platform romp with sassy attitude. It's got state of the art PS2 graphics – technorific! You can win a copy, and if you win, you'll also score the fabulous Muckle Jak. It's 31cm of cast resin art, and we reckon it's probably hand painted too. Thanks to Sony Computer Entertainment!

Q: Which psychologist performed experiments upon their own child using a fuzzy rat and a metal pole?



④ Jazz J8901 speakers

'Lifestyle' is a strange and wonderful word. It is abused and misused by PR, marketing and sales types – all variants of the same species. It's understood to mean a category into which things that are not 'niche' are placed. It's a word with connotations of carefree happiness. It is certainly an optimistic word. One can think of 'Lifestyle Condoms'. Or think barely dressed, riding a white horse in the surf. If you can't manage that, think Pamela Anderson. Thanks to Rectron (www.rectron.com.au) for providing these lifestyle multimedia speakers.

Q: At what speed in metres per second would you need to fire a cannon ball at (assuming there is no wind resistance and the earth is geomorphically flat) for the cannon ball to never hit the earth?



④ 6 x Max Payne 2 limited edition amazing packs!

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A thought cracked open my addled mind, like a half-detонated cluster bomb... Was I just a two-dimensional character, frozen in time and pressed into stasis upon some other existential plane? Was I just one of many, varied items used to promote someone else's reality? Could there be an army of me, covering every available surface, promising death and beauty and a life less ordinary? I could only speculate... Thanks Take 2!

Q: Is it possible, using only a compass and a pencil, to start with a circle and create a square with a perimeter the same length of the circle's circumference?



④ Lite-On 411s Internal DVD

Everyone loves Lite-On drives. Just why will forever remain a mystery to the RIAA and others, but Lite-On drives are the optical burner of choice for hardcore users. The Lite-On 411s Internal DVD looks like any other DVD burner, eg: dull and drab. Inside is where it counts though, and this baby supports both + and - standards. Eureka! As you surely recall, *Atomic* reviewed this drive last month (page 59) and scored it an impressively almost-9 – 8.5. Now you can own one of these little rippers, thanks to Synnex (www.synnex.com.au).



Q: According to international standards, how large does a quartz grain need to be before it can officially be called sand?

EMAIL ENTRIES TO WIN@ATOMICMPC.COM.AU OR POST THEM TO: ATOMIC, PO BOX 2286, STRAWBERRY HILLS NSW 2012. PLEASE SEND A SEPARATE ENTRY FOR EACH COMPETITION. PLEASE ENSURE THE COMPETITION NAME IS THE SUBJECT OF THE EMAIL, OR IS DISPLAYED CLEARLY ON THE FRONT OF THE ENVELOPE. THE CLOSING DATE FOR ENTRIES IS 21 JANUARY 2004. WINNERS WILL BE ANNOUNCED IN ATOMIC 38.

Atomic 34 Winners:

Ultimate retro gamer's pack from Game Traders Q. What will female Adelie penguins do for a handful of nesting stones? A. Have sex. T. Pavlic, Redwood Park, SA. Minitar Gigabit five-port switch Q. How do Bonobo monkeys resolve conflict? A. Have sex. S. Hadrill, Kalgoorlie, WA. Thermaltake Lanfire case Q. What would cause a female Praying Mantis to eat her partner's head? A. Whilst having sex to provide sustenance for the eggs she will lay. R. Lent, Umina, NSW. Cooler Master Jet 7 HSF Q. What does an African Mole Rat queen do to all her male minions? Bully all of them to create stress and thus a lower sperm count in all but her chosen mates. N. Atkin, Macleod, VIC.

2 x BenQ LCD Monitors Q. Do LCD panels emit their own light? A. No. M. Henderson, Padbury, WA. N. Wadsworth, Rockhampton, QLD.

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Sub-tle machinations



a **\$3,000** BENQ JOYBOOK

So many names for so many things – monitor, display and screen. Tower, case and computer. France, French and ponces. Where do we draw the line with the English language?

We don't, of course. It would stop everyone, *Atomic* included, from making words up. Take BenQ's slim and slick Joybook 8000 VO2 notebook. Or is that laptop? Or Lapjoy? Whatever it is, it's pretty classy. Classy in a smooth, silvery sort of way. With a 2.2GHz Pentium M processor and a GeForce4 Go ticking away under the hood, BenQ can make up all the words it wants.

We have one of these \$2,999 babies to give away, and all you need do is subscribe or renew this month to have a chance to win. Imagine *Atomic*, door delivered, while saving almost half off the cover price. Yeah.

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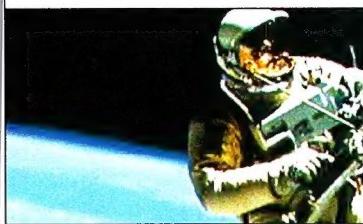
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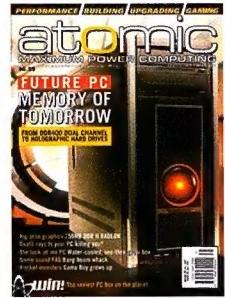
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Economy class computing

John Simpson ponders the PC class system with his knees wedged in his ears.

Last year there were 100 reported incidents of air rage on UK airliners. Almost all of those involved long distance travellers, seated in economy class (or, as the air crews call it, cattle class).

Having just returned from a trip to Europe I can sympathise. There's only so many times you can watch Arnie get beaten up by a woman ('Mine eyes! The goggles do nuttink!') or have your butt kicked in chess by seat 36G. Economy long haul seating is the modern equivalent of the iron maiden – initially the seats look comfy and accommodating, but after about four hours your arse is begging for mercy and you'll confess to just about anything (if Air Stewardess Natalie reads this, I only stole those Pringles because my cousin dared me and, honestly, all my underwear is men's).

During those hours of purgatory, my clouded mind turned to more pleasant thoughts: my computer. There she was, sitting alone at home for three weeks. Three weeks is a long time to be apart, and it was all I could do not to call out her components.

In those tortured hours, I thought back to researching and buying each part of my Ms Frankenstein... and something odd occurred to me. Even in computers, there's a distinct class of entry based on price. An economy, business

and first class option for each component, effectively sorting the plebs from the elite.

I recalled my search for a 19in monitor. Charlie's PC Barn had them set out in a row, like Indiana Jones and the Holy Grail. The economy level was a no-name beige box with a screen so curved you could roll it down a bowling alley. Business class was an Acer, with a few buttons on the front, and a dot pitch so big the screen looked like a Greek mosaic. First class was the massively expensive Sony Trinitron, a legend in its day, with brilliant colours and a box so big you could use it as a granny flat. Ah yes, I had found my Grail.

It was then I realised I could never travel the road of economy computer class. Every fibre of my being urged me to take the Sony, although my budget said it was either that or not eating for the next month. Suffice to say I got skinnier.

The monetary decisions we make are a constant source of interest for economists: why does one person buy a screen that's twice the price of another when, on the surface, it looks like it does the same job? It's a term known as 'propensity to consume'.

Apparently there are three things we get from buying something: a value based on the use we'll get from it; an investment value, how much we can sell it for; and a consumer benefit, how much we personally value owning the item.

Consumer benefit can't be accurately measured, simply because it varies from person to person. For me, buying a nice monitor means I can show it off to my mates, and I know that I've done a good thing. For my mum, buying one monitor or another makes bugger-all difference, because they both do the same job (crazy, I know). That's the basis of consumer benefit.

So I went out and bought the Sony Trinitron, and have loved it ever since. My mum, coincidentally, owns a no-name tube that she runs at 640 x 480 (apparently it can go higher, but the text blurs so much you can't read it). Economists would say that we're both justified, as we've both spent exactly as much as the value we've received back. Fantastic!

Which makes me wonder about economy class on long haul flights. Would I really get an extra four or five thousand dollars consumer benefit from sitting in business class? Sure, I value my spine, and I'm a contender for 'most likely to go ballistic during turbulence'. But four grand for 22 hours?

Maybe not. Which is a real shame, as I could handle a day of being pampered by stewardesses with nothing but my best interests in mind. And the better food. And movies. And lack of screaming children. And footrests that extend at the touch of a button.

I guess it's back to two minute noodles... ▶

crashtest

#9 - The Everyday Life of Max Payne

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DAGGER WEAVING ITS WAY INTO ITS
INTENDED VICTIM'S HEART.

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A CREVASSE OF MY OWN CHOICES OPE...

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do you have to do this every
time we eat out?

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with that?

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STOOD OUT IN ITS DONUTTY
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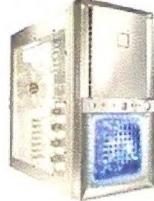
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